

**VE (DI) FUEL-
INJECTION PUMPS**

**Workshop: EP
06.1994
0393 En**

Shutoff problems

Pumps affected

0 460 414 073	Ford
0 460 414 074	"
0 460 414 075	"
0 460 414 083	"
0 460 414 085	"
C 460 414 086	"
0 460 414 089	"
0 460 414 069	Landrover
0 460 414 080	"
0 460 414 093	"

If shutoff problems are encountered on a vehicle with a VE pump featuring this type number outside the warranty period, all the fuel-injection pumps concerned must in future be checked as follows by Bosch Service Stations:

In such cases, please check for signs of abnormal wear at cam plate or at rollers of roller ring.

If so,

1. renew cam plate and roller ring
2. send in damaged parts together with warranty and goodwill claim, in Germany to K5/QSG1, in all other countries to our authorized representative.

This procedure is subject to the following restrictions:

- 1. Above-mentioned VE-pumps with stated type numbers only.**
- 2. Dates of manufacture (FD) from 950 to 364 (10.89 - 4.93)**
- 3. Mileage max. 100 000 km**
- 4. Period of validity of this stipulation up to end of 1995**

This complaint is to be indicated in the warranty and goodwill claim under warranty type "7" and defect number "68".

Published by:

**ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)**

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PES 6 P..
INJECTION PUMPS:
0 402 046 226
0 402 046 247

Workshop: EP
06.1994
0403 En

Mack Midliner MS/CS-300

Some of the Mack-Midliner engines equipped with the above injection pumps will develop a "miss" in part-load rack positions between 1200 and 1400 RPM.

To correct this condition it is necessary to replace the existing plungers and barrels with part number 2 418 455 096.

To obtain full load delivery, the new plungers and barrels will require higher control rack travels than listed in the test specifications for these combinations. For correct adjustment of the new plungers and barrels, use the respective fuel flows of combinations ...226 and ...247 while using the control rack settings from combination ...334 and ...335. The following should further clarify these instructions.

TO OBTAIN THE FUEL DELIVERIES
SPECIFIED FOR COMBINATION:
0 402 046 226

Use the control rack travels specified
for combination 0 402 046 334.

TO OBTAIN THE FUEL DELIVERIES
SPECIFIED FOR COMBINATION:
0 402 046 247

Use the control rack travels specified
for combination 0 402 046 335.

With 1/8" letters, stamp the pump AND
governor name tags with the initials
"RVI" to identify the modification to
the pump. Locate them in a place on
the tags where the existing
information will not be destroyed.

All work in and out of Bosch standard
warranty period is to be performed at
customer's expense.

**ROBERT BOSCH Corporation
Service Department
Automotive Diesel Products
(UA/ASV)**

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PES 6P 110A 720 RS 3150
9 400 087 335
RQV 350-1300 PA 776

Workshop: EP
06.1994
0404 En

Ford

You may receive complaints of "engine stalls while shifting" or "control rack stuck in shut-off position" on the subject injection pump having a MDC 749 (Sept. 1987) or earlier.

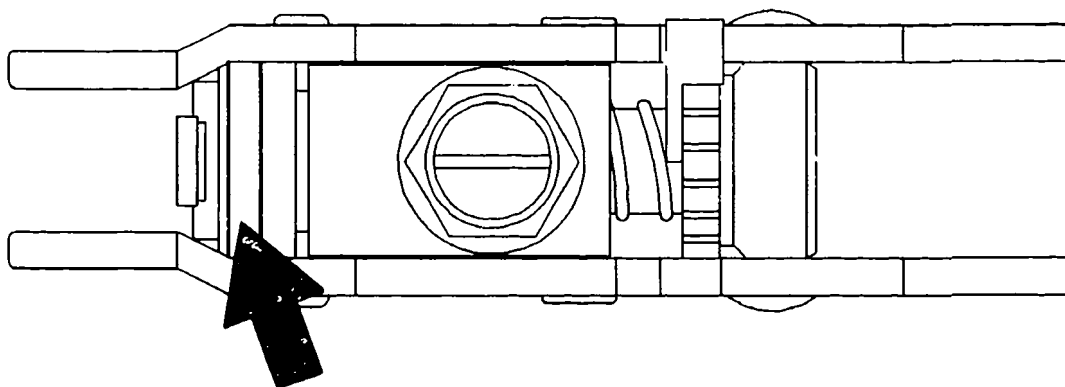
The problem may be due to incorrect basic fuel versus rack adjustment and/or interlocking of the aneroid full load strap with the torque link.

Inspect the injection pump and verify that the control rack is stuck, remove aneroid. If control rack remains stuck, inspect for failure and repair in the usual manner. If the control rack moves freely, re-attach aneroid and mount injection pump on test stand and perform the following test/repair steps:

1. Check full load rack position as per test specifications (1300 RPM, 13.6 mm -13.7 mm). If higher than specified, readjust to specifications.
2. Completely remove the shut-off stop screw. At idle RPM WITH FULL BOOST to aneroid and control lever at the idle, bring the control rack to "0" rack by means of the shut-off lever and then release the shut-off lever. If the rack does not return to the low idle rack position, the complaint has been simulated and confirmed.

3. Replace torque link 9 421 080 683.
The new torque link must have a
square 2 mm spacer (see
illustration).

KMK05050



4. Following torque link replacement repeat step 2. The control rack must return to idle rack position.

Standard warranty terms apply. You will be reimbursed 1.8 hours labor plus parts. File a warranty claim and test data sheet showing both incoming and outgoing test results.

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PES 6 A..

0 400 846 566 /569

0 400 230 120 /121 /122

Workshop: EP

06.1994

0405 En

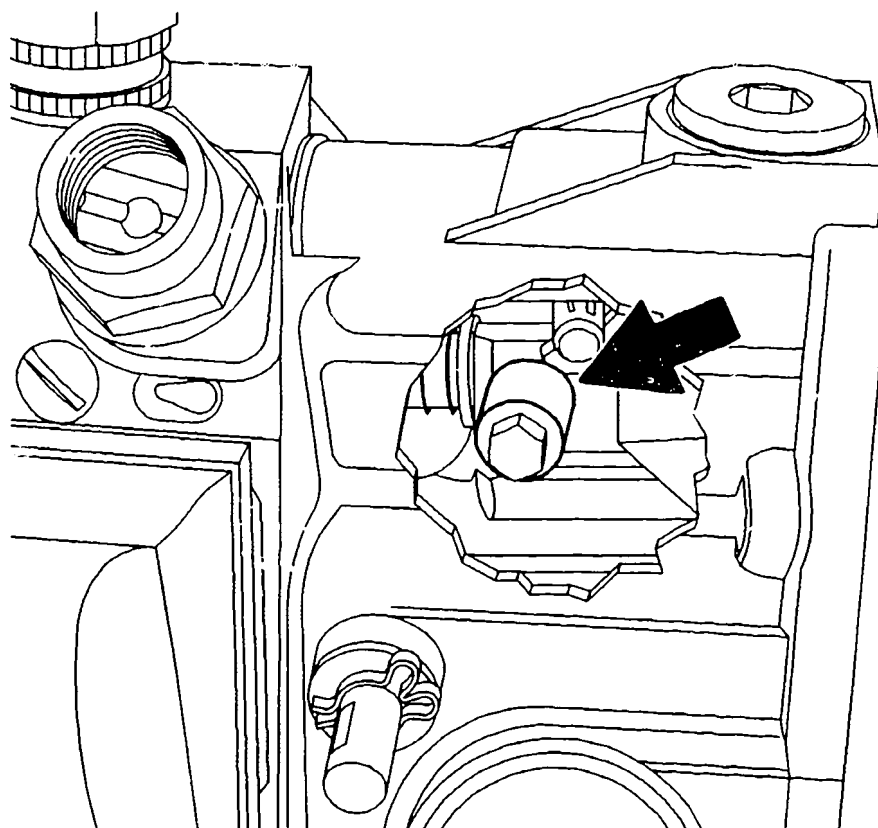
Navistar

Subject:

Loose Rack to Governor Link

Connecting Bolt and Nut

The subject connecting bolt and nut
(see Ill. 1 and 2) may be loose on the
following injection pump/governor
combinations:



KMK05051

0 400 846 566
PES6A.RS2770,

RQV.AB1242R

0 400 846 569
PES6A.RS2770,

RQV.AB1236-3R

9 400 230 120
PES6A.RS2750,

RQV.AB1236R

9 400 230 121
PES6A.RS2750,

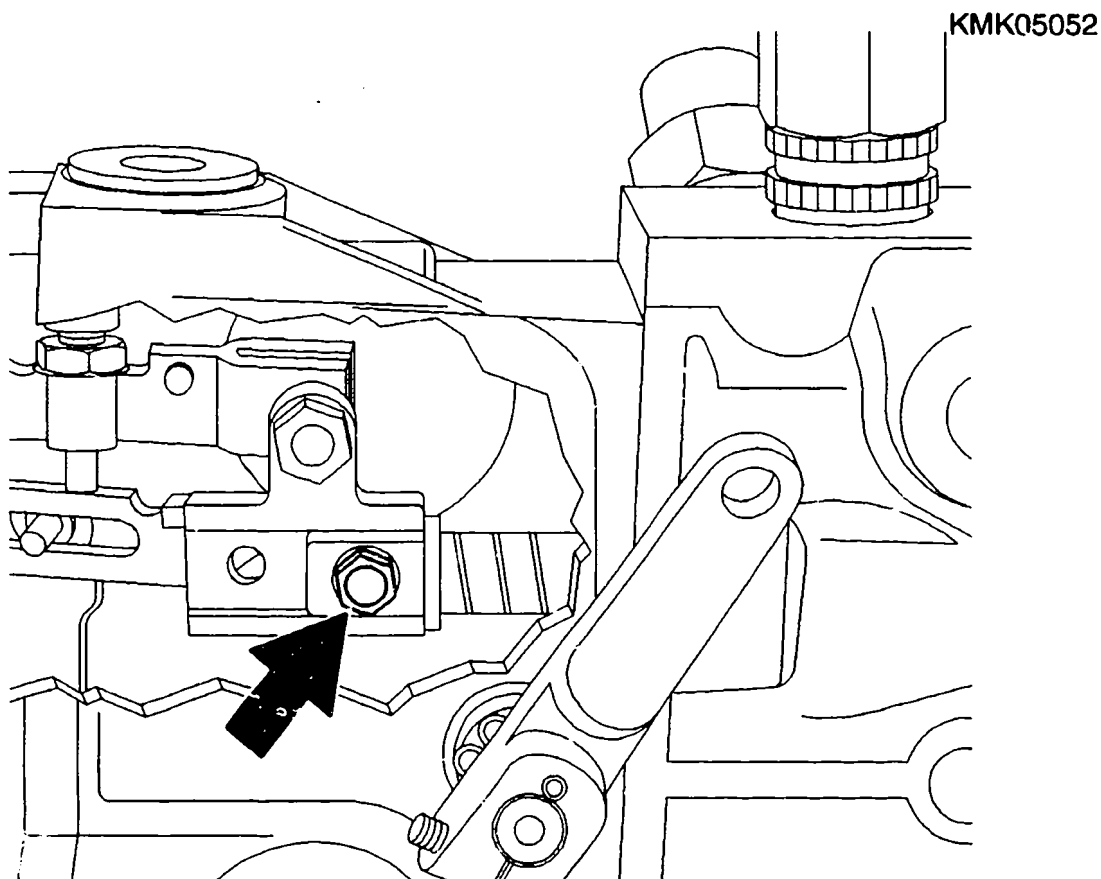
RQV.AB1236-1R

9 400 230 122
PES6A.RS2745,

RQV.AB1236-2R

Affected production is from MDC 848 (Aug. 1988) to MDC 941 (Jan. 1989) inclusive.

When servicing the above combinations, the tightening torque of the connecting bolt and nut must be checked and, if necessary, increased to the specified value of 3.5-4.5 NM.

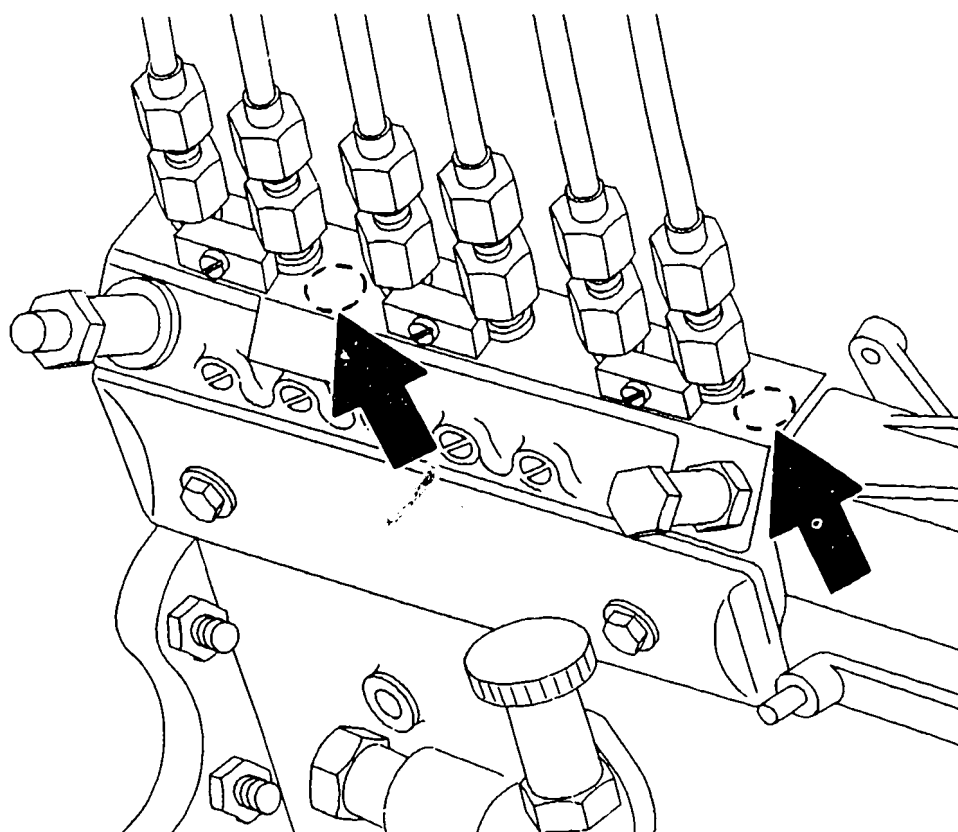


Combinations stamped with the letter "C" or "R" between cyl. #2 and #3,

an asterisk "*" or the letter "R" on the governor side of cyl. #6,

or the number "8" between cyl. #4 and #5

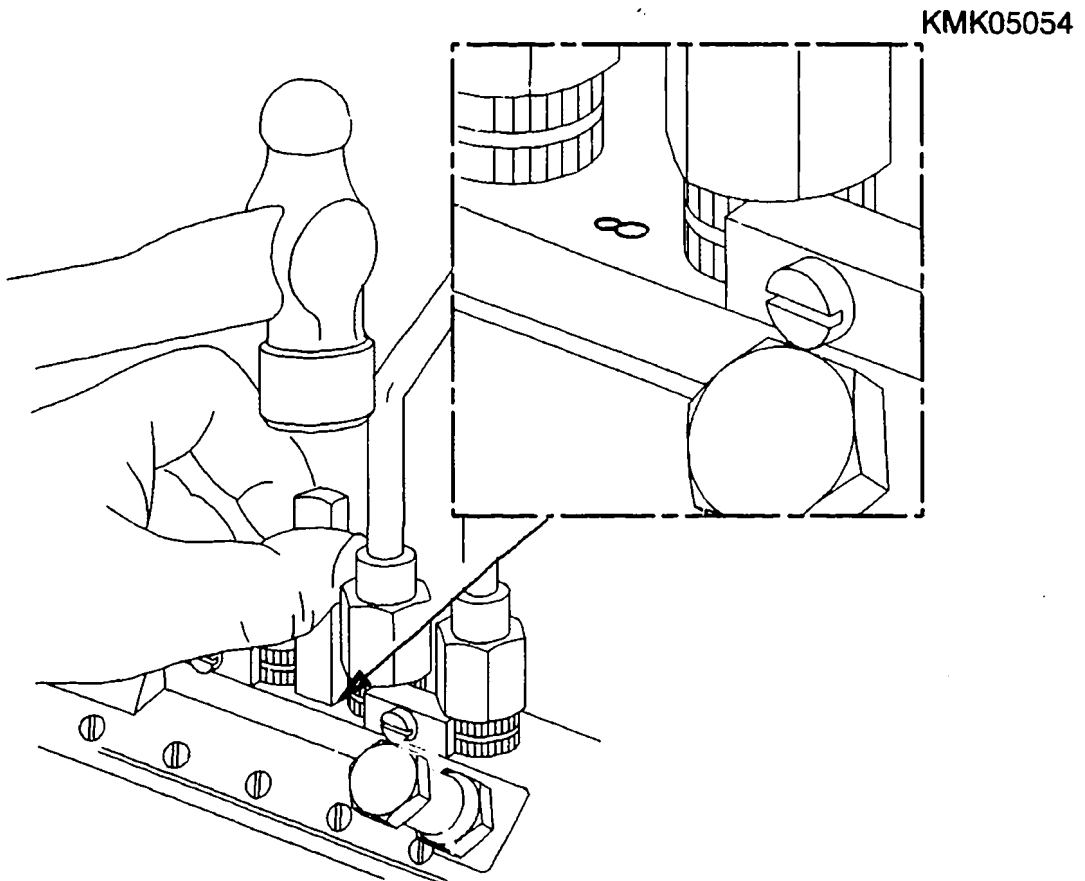
have been previously checked/corrected (see Ill. 3 and 4) and require no further action.



KMK05053

When you have completed the torque check or retorquing of the connecting bolt and nut, stamp the Number 8 between Cylinder Nos. 4 and 5 as shown in Illustration 4.

You will be reimbursed 0.3 hours for performing this service. The warranty claim, in addition to the usual warranty data, MUST show the respective engine serial number, otherwise the claim will be denied.



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PE 6 P..
0 401 846 854 /856
Volvo GM (VGHT)

Workshop: EP
06.1994
0406 En

Subject:
0 401 846 854, Eng. TD 122
FCQ - Roadway

0 401 846 856, Eng. TD 102
FBQ - Coastal Transfer
Heavy Duty Flyweight Conversion

This service letter supersedes our
mailgram dated 08/01/90.

A limited number of governors on the
subject injection pump have been
converted to a heavy duty flyweight
version. The injection pump and/or
governor nameplate are stamped with
the letters "HD" identifying the
conversion.

The governor parts list in the fiche
will NOT reflect this conversion.
When servicing a converted governor
and if parts replacement becomes
necessary, you must substitute the
following part numbers for the
positions shown in the fiche:

Pos.		Qty				
800	Flywt Assembly	1	2	428	100	511
800/8	Drive Hub	1	2	426	449	008
800/9	Buffers	4	2	420	026	006
800/12	Retainer	1	2	420	500	056

All other parts listed are identical to the ones shown for governor RQV 250-850 PA 921-12. Adjustment of injection pump combination to be made per specifications for 0 401 846 854.

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Automotive Diesel Products
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RQ, RQV... Workshop: EP
RQ 300-1150 MWV 17112/17113 06.1994
RQV 300-1150 MWV 17305 0407 En
Deutz Osterlund (Giant Trucks)

Subject:
Cross Reference Experimental
to Released Parts Designation

When servicing the following
experimental governors, the parts list
and test specifications of the
released version can be utilized.

Experimental BOSCH Parts Designation:
RQ 300-1150 MWV 17112

Released BOSCH Part Number:
0 420 082 016

Released BOSCH Parts Designation:
RQ 300-1150 MW 63

Experimental BOSCH Parts Designation:
RQ 300-1150 MWV 17113

Released BOSCH Part Number:
0 420 082 019

Released BOSCH Parts Designation:
RQ 300-1150 MW 63-2

Experimental BOSCH Parts Designation:
RQV 300-1150 MWV 17305

Released BOSCH Part Number:
0 420 083 125

Released BOSCH Parts Designation:
RQV 300-1150 MW 56-1

New governor name plates, with the released Bosch parts designation, are available free of charge. Please contact the Service Department for delivery.

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RSV/A AND RSV/MW
COMBINATIONS FOR
CUMMINS ENGINES

Workshop: EP
06.1994
0408 En

Worn Governor Flyweights on

Worn flyweight pinbores may occur on the subject applications. When performing warranty repairs on these injection pump/governor combinations the current flyweights should be replaced according to the following:

CURRENT FLYWEIGHT PART NUMBER	REPLACE WITH FLYWEIGHT PART NUMBER
-------------------------------------	--

9 421 270 040	1 428 194 026
9 420 270 191	1 428 194 025

Standard warranty terms for Cummins apply. Please submit claim and parts through regular channels.

**ROBERT BOSCH Corporation
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PES 6 A...
9 400 230 066/067

Workshop: EP
06.1994
0410 En

John Deere
Subject: No Load Miss/Irregular
Exhaust Beat

Complaints of a "no load miss",
"irregular exhaust beat" or "popping
in the exhaust" may occur on engines
with injection pump/governor
combinations 9 400 230 066, ...067,
with a manufacturing date up to and
including MFD 749 (September 1987).

This occurs primarily with a hot
engine between 1100-1500 rpm and
disappears when load is applied. This
condition is due to a fuel delivery
imbalance in the 4.5 mm RT range which
can be corrected by readjusting the
equal delivery to the following
tolerances:

Combination Number
9 400 230 066

Pump Speed	Rack (mm)	Setting Spread Tol. MM3/STR	Over Check Tolerance MM3/STR
750	4.5	4.0	5.0
425	5.3-5.5	7.0	9.0

9 400 230 067

Pump Speed	Rack (mm)	Setting Spread Tol. MM3/STR	Over Check Tolerance MM3/STR
750	4.5	4.0	5.0
425	5.8-6.0	7.0	9.0

Rated speed equal delivery must be checked following readjustment. In those cases where equal delivery readjustment does not correct the problem, the specific out of balance P B must be replaced and the injection pump must be calibrated to specifications and checked/adjusted to the values above.

All injection pumps with MFD 750 and newer are adjusted to these new tolerances.

All work in and out of Bosch standard warranty period, is to be done at customers' expense.

**ROBERT BOSCH Corporation
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PES 6 P...
9 400 087 422
Ford - FNH

Workshop: EP
06.1994
0411 En

Subject: 185 HP Engines 1991 Model
Year Low Power Complaints

Ford and Bosch have released a new spec. for pump combination number 9 400 087 422 in order to alleviate performance complaints on the 185 HP rating.

The following changes are required to complete the modification:

1. Replace LDA stop lever P/N 2 421 960 042 with LDA stop lever P/N 2 421 960 056.
2. Calibrate pump according to specification revision 4a dated 05.06.91 (copy attached).

These changes have been requested by FNH and are not covered by Bosch warranty.

Pumps affected are prior to MDC 166 (Manufacturing Date June, 1991).

Following the modification, an "M" should be stamped in the housing above the nameplate. Ford has already modified some pumps before installing them in trucks. These pumps are prior to MDC 166 and have an "M" stamped in the housing.

Ford is in the process of issuing a letter to their distributors stating that if they have a truck which requires modifying they should first contact the Bosch DSD to insure parts are available prior to removing the pump from the engine.

Refer to Combination Number:

9 400 087 422

Edition Number:

05.06.91

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PES 4 M..

0 400 074 889, ..890, ..891

Workshop: EP

06.1994

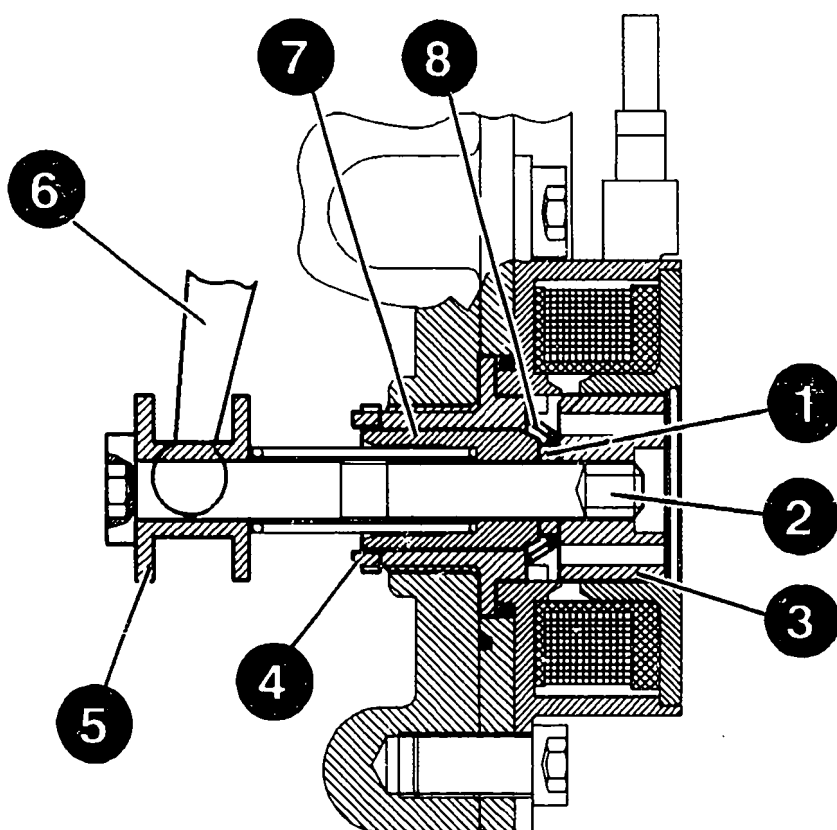
0390 En

Bucking whilst driving on IP assemblies
with active surge damping, short
(K-ARD)

In the event of complaint "BUCKING
WHILST DRIVING" with the above IP
assemblies, replace shim, ARD stroke
at ARD solenoid in line with service
parts list.

ARD COMPONENTS

- 1 = Shim, ARD stroke
(brass)
- 2 = Full-load adjusting screw
- 3 = Armature
- 4 = Outer threaded sleeve
- 5 = Driver
- 6 = Fulcrum lever
- 7 = Guide sleeve (full-load screw)
- 8 = Return spring



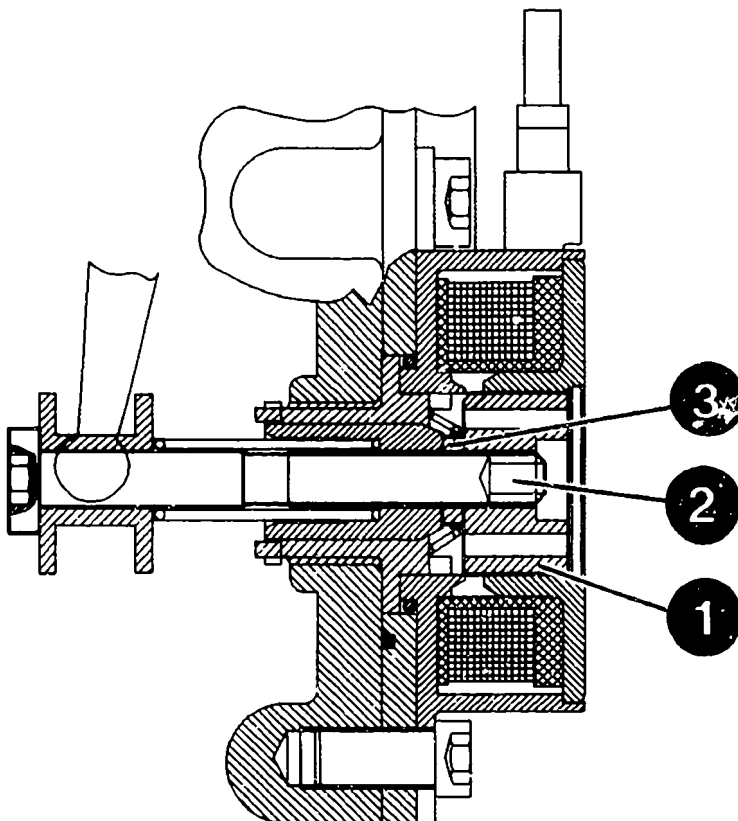
KMK04786

REMOVING SHIM, ARD STROKE

- 1 = Armature
- 2 = Full-load screw
- 3 = Shim, ARD stroke

Remove ARD fastening screws.
Loosen armature with socket wrench
KDEP 1911 - 0 986 612 599.
Whilst doing so, conterhold full-load
screw with 3 mm Allen wrench.
Remove return spring.
Remove shim, ARD stroke.
Replace shim removed (thickness of
shim 2.55 mm instead of 3.15 mm).

KMK04787



ARD ASSEMBLY

4 = Return spring

5 = Guide sleeve

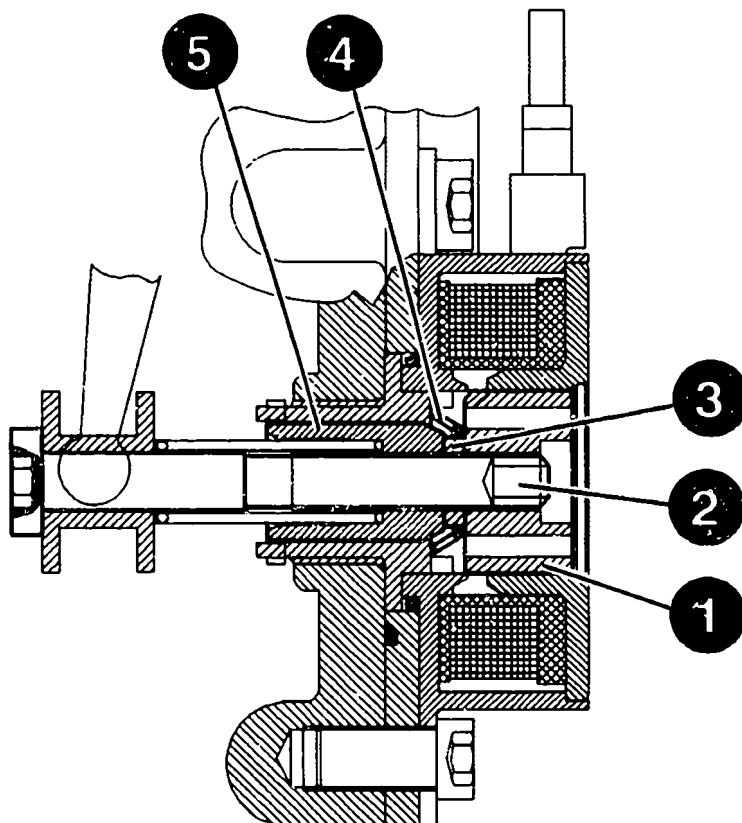
Insert return spring in correct position. Screw armature by hand on to full-load screw.

Insert socket wrench 0 986 612 599 in holes in armature and tighten to 5...7 Nm.

Counterhold full-load adjusting screw whilst doing so.

Following armature assembly, locating lug of guide sleeve must engage in recess in outer threaded sleeve.

The costs of conversion are to be billed.



KMK04788

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PE(S)..P..S 8000 and
PE(S)..P..S 8500

Workshop: EP
06.1994
0394 En

MODIFICATION OF ASSEMBLY SEAL

Re: In-line pumps with cross-scavenging

With the above-mentioned in-line pumps the assembly seal is provided by a support-ring/O-ring/support-ring configuration.

The new assembly seal was introduced on in-line pumps with cross-scavenging on account of the greater seal loading.

The slotted support rings used to date are being replaced in the course of the current series by solid support rings.

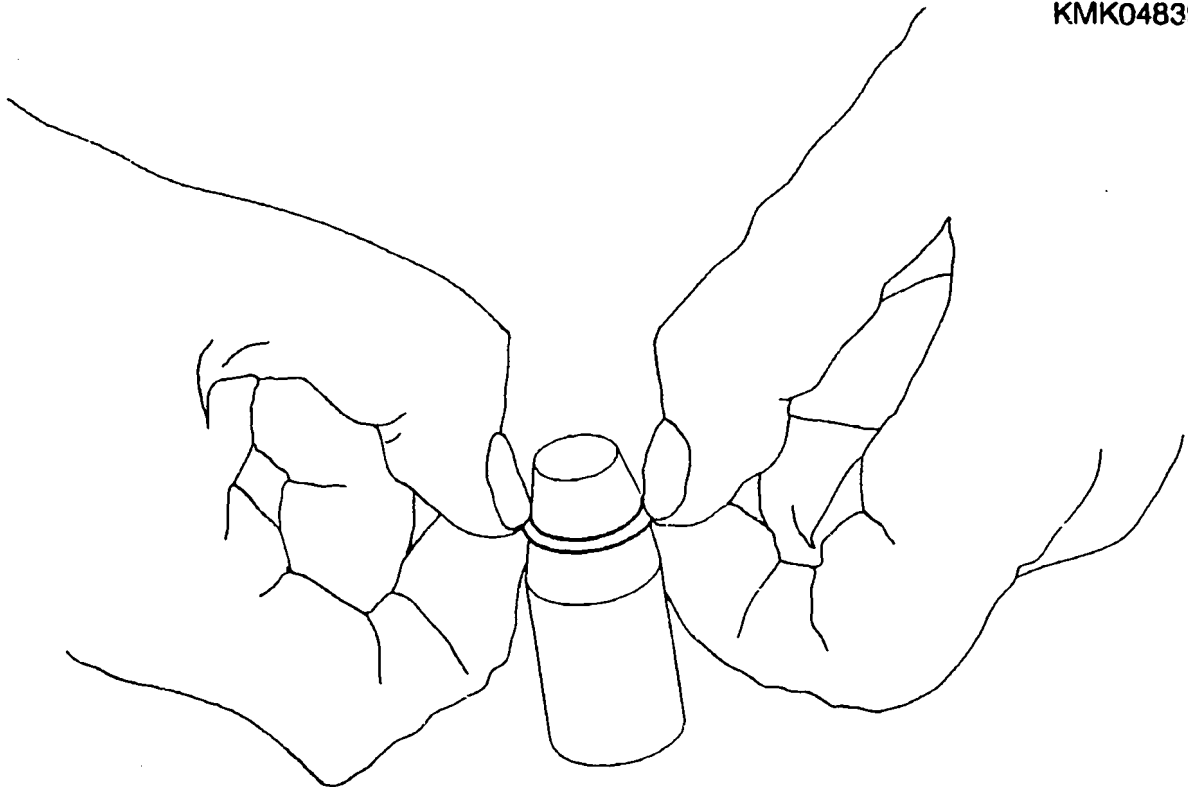
As a result of this modification, the support rings must be fitted with extreme care. Attention must be paid to the procedure outlined in the following.

Place the inner part of the assembly device 0 986 612 495 on a firm base. Hold support ring firmly between thumb and index finger of both hands and slowly slip over taper onto cylindrical section of inner part (picture).

During the slip-on process the support ring adapts to the size of the assembly device. If the support ring is pushed on too quickly, there is a danger of it collapsing.

If this happens, permanent deformation will result and the ring must be scrapped.

KMK04839

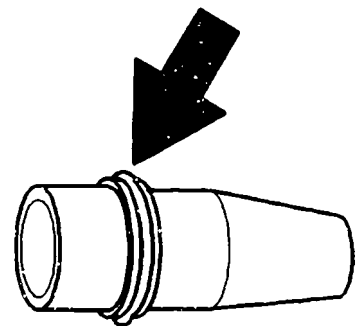
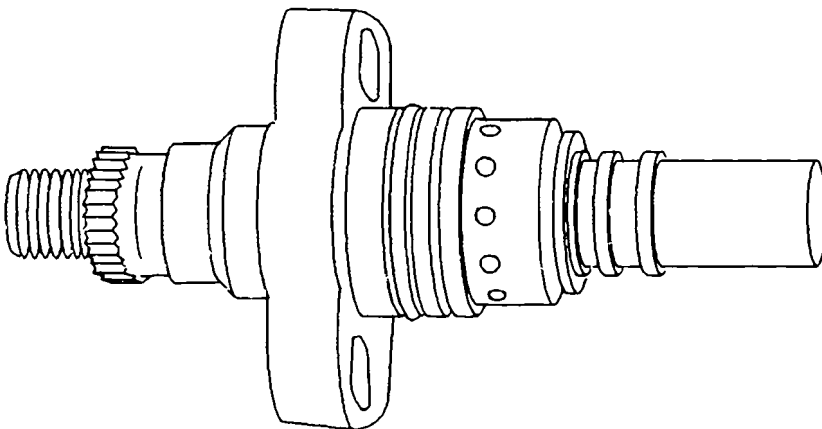


Slip O-ring over inner part such that it makes contact with support ring already fitted.

Install second support ring accordingly.

Slide inner part with support ring/O-ring/support ring (arrow) over assembly as far as they will go.

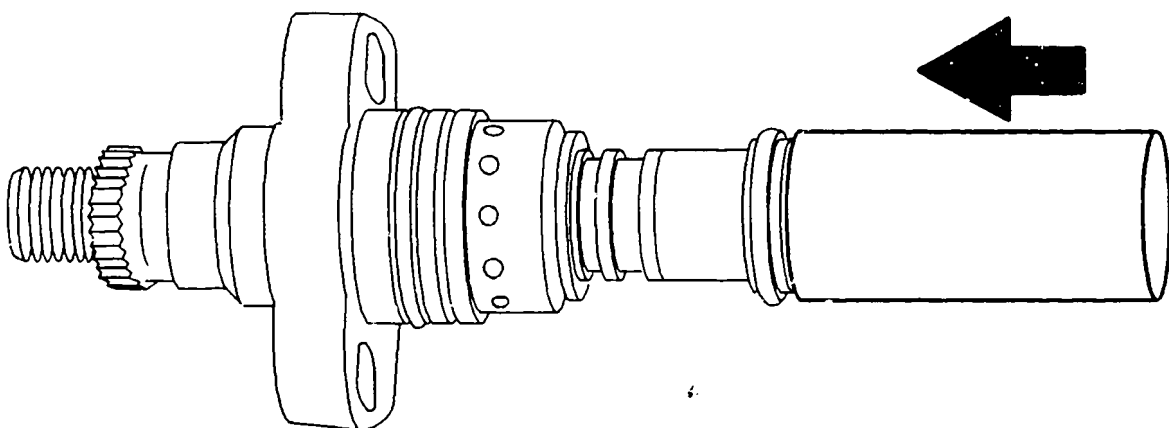
KMK03652



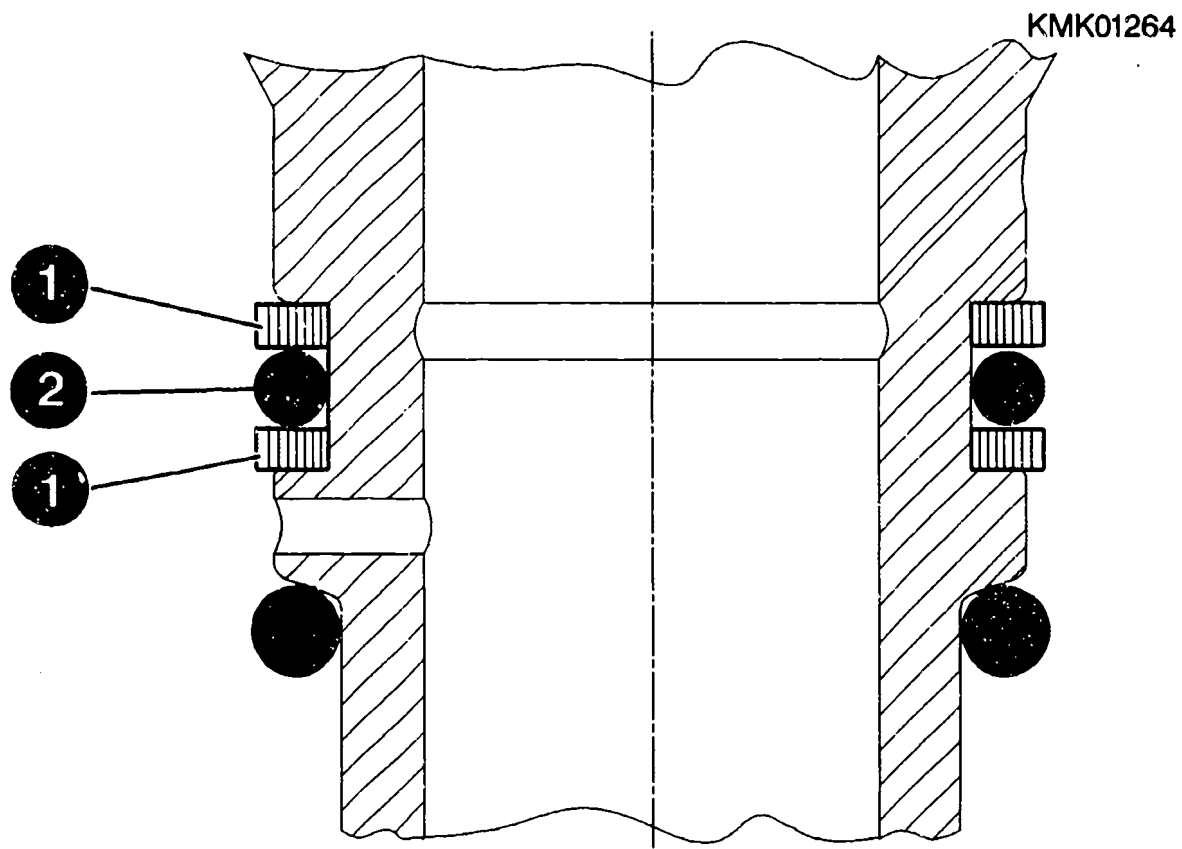
Slip support ring/O-ring/support ring
with outer part of assembly device
0 986 612 495 onto assembly (picture).

In doing so, make sure support ring
does not collapse.

KMK03653



Check whether support ring (1)/
O-ring (2)/support ring (1) are
correctly positioned as shown.



Note:

- * When performing repairs, support rings and O-rings already fitted are to be replaced with new ones.
- * Support rings which collapsed on assembly are to be replaced with new ones.
- * Pump housings and plunger-and-barrel assemblies of old (slotted support ring) and new (solid support ring) versions are identical. Slotted support ring can therefore simply be replaced by solid type.

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**Robert Bosch GmbH
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PE(S)...P... WITH
EDC POSITIONER RE...

008.93 En
06.1994

Adjustment instructions

A detailed and full description of all test and adjustment procedures for EDC fuel-injection equipment PE(S)...P... with positioner RE... can be found on microcard VDT-W 400/019.

We would stress that the specifications given there for the DC voltmeter must be observed.

Voltmeter:

The microcard VDT-W 400/019 outlines the requirements in terms of basic DC accuracy in the list of testers, tools and devices for the voltmeter (digital multimeter):

- Deviation less than 0.1 % from reading.
- Resolution 0.001 V in measuring range up to approx. 4 V.

Compliance with these requirements is absolutely essential.

Voltmeter:

Our investigations into various events in recent times have shown that use has been made of measuring instruments with insufficient accuracy.

This results in considerable overshooting of the IP adjustment tolerances and thus leads to complaints about performance, engine power and consumption.

In worst-case situations the engine will not start. The stated accuracy requirements are satisfied, for example, by the multimeter "Fluke 87". The Bosch multimeter MMD 301 (0 684 500 301) is not capable of such accuracy and is therefore unsuitable.

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PE (S) P-8500

Workshop: EP

06.1994

P-8500 Test Equipment
Requirements

0398 En

By the end of October, 1993 various Mack E7 engines will be equipped with a new Bosch model P-8500 fuel injection pump capable of delivering the higher injection pressures needed to meet 1994 emissions.

These upcoming versions (0 402 996 301 and ... 302) require greater drive torque than does the P-7100 injection pump.

At 900 RPM test benches must deliver a minimum of 7.5 kW with a minimum 0.5 kgm² flywheel inertia and the drive coupling must have a minimum 3000 Nm/degrees torsional rigidity. Please make sure that your test equipment meets these requirements before servicing the P-8500.

NOTICE:

FOR SAFETY REASONS, BOSCH REQUIRES THE INSTALLATION AND USE OF A NEW, JAWLESS DESIGN DRIVE COUPLING ON BOSCH TEST BENCHES THAT WITHSTANDS THE ABOVE DRIVE TORQUE CRITERIA WHEN TESTING P-8500 INJECTION PUMPS. FAILURE TO USE A COUPLING WHICH MEETS THE STANDARDS SET FORTH ABOVE MAY RESULT IN THE DESTRUCTION OF THE COUPLING AND THE PROTECTIVE SHIELD ON THE TEST BENCH. PLEASE NOTIFY ALL SHOP PERSONNEL PROMPTLY.

Bosch has available a coupling for Bosch test benches sufficient to test the P-8500 pump. Please update your Bosch test bench with these components in preparation for testing the P-8500.

**ROBERT BOSCH Corporation
Service Department
Automotive Diesel Products
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PE(S) MW...
NAVISTAR APPLICATIONS

Workshop: EP
06.1994
0399 En

Sticking Plungers
P/N 1 418 415 093

Navistar has been experiencing sticking MW-pump plungers on some truck applications. The complaints have all been that the vehicle won't start following shut-down. Average miles to failure is 17.300 although failures have occurred with as many as 77.000 miles on a vehicle.

Failures have been limited to MW-pump manufacturing date codes (MDC) 950-062. The cause of failure is related to a heat treat process problem.

Pump numbers affected:

0 403 446 227
0 403 446 228
0 403 446 229

If you receive a pump for warranty repair with a tight plunger, the plunger is NOT scored, is of MDC 950-062 and is one of the pump numbers listed above, we recommend that all six elements be replaced. This will be covered under Bosch warranty. Standard warranty terms apply.

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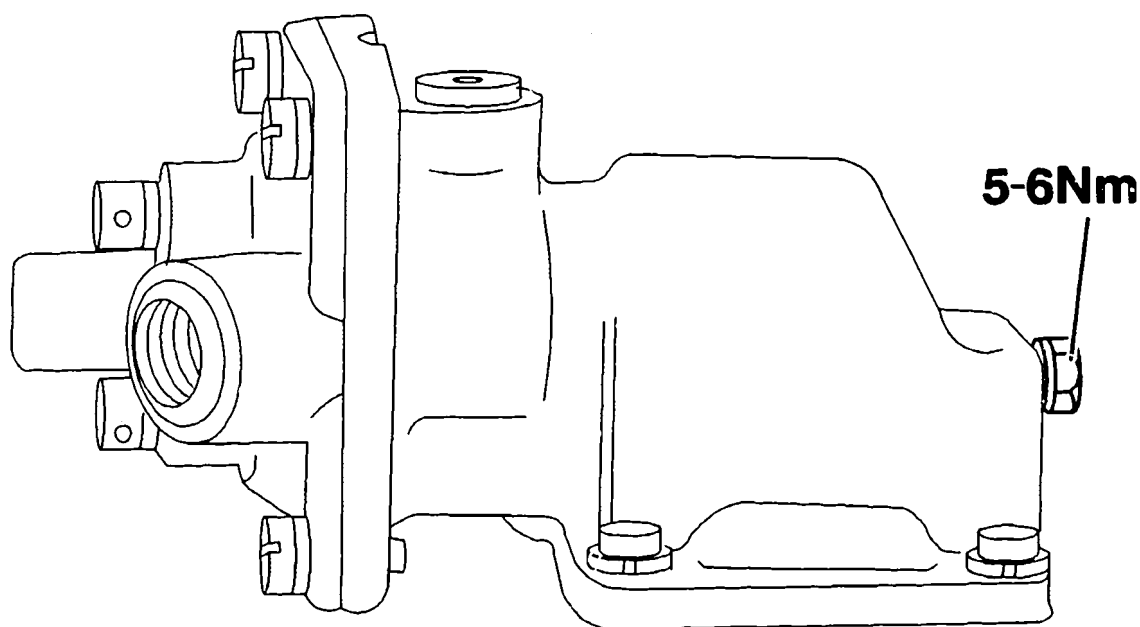
P-7100 0 402 746...
WITH RQV-K LDA

Workshop: EP
06.1994
0400 En

Adjustments

When performing starting fuel quantity adjustments on P-7100 injection pump combinations using top-mounted LDA assemblies, be certain to apply the correct torque to the locking screw and ensure that there is full movement capacity of the stop part after doing so. The specified torque of the locking screw is 5...6 Nm (see illustration).

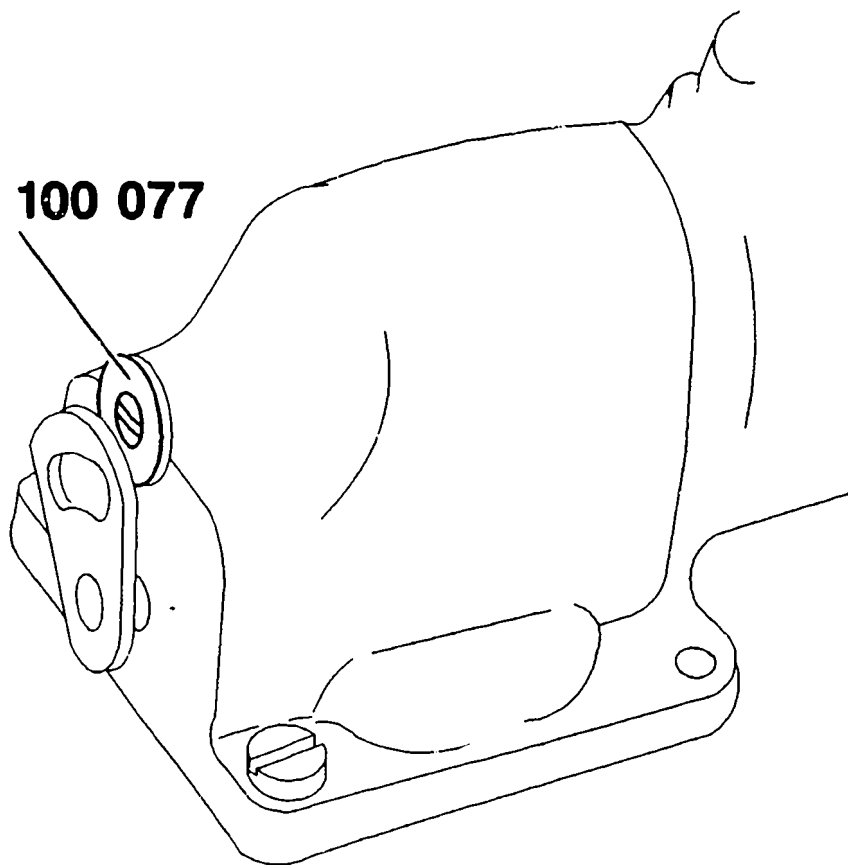
KMK04725



In the event that the stop part does not slide on the eccentric shaft when the setting screw is tightened, install a 0.5mm shim part number 2 420 100 077 between the adjusting quadrant of the shaft and the housing. Pass the screw threads through the center hole in the shim (see illustration).

KMK04726

2 420 100 077



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IP TEST BENCH

Workshop: EP

06.1994

0395 En

Locking device between
clamping flange and clamping bracket

Increasing peak pressures and greater
assembly diameters for Diesel fuel-
injection pumps are leading to ever
higher drive power.

This may mean that the friction-locked
connection between clamping bracket
and clamping flange is not reliably
guaranteed in all instances.

For s a f e t y r e a s o n s a
positive locking device is thus being
introduced as standard:

The clamping brackets are provided with
2 holes each with a diameter of 6.0 mm,
whereas the clamping flanges are
provided with either 1 or 2 holes with
a diameter of 5.1 ± 0.1 mm, into which
the slotted spring pins are inserted.
The position of the holes can be seen
from the following drawings.

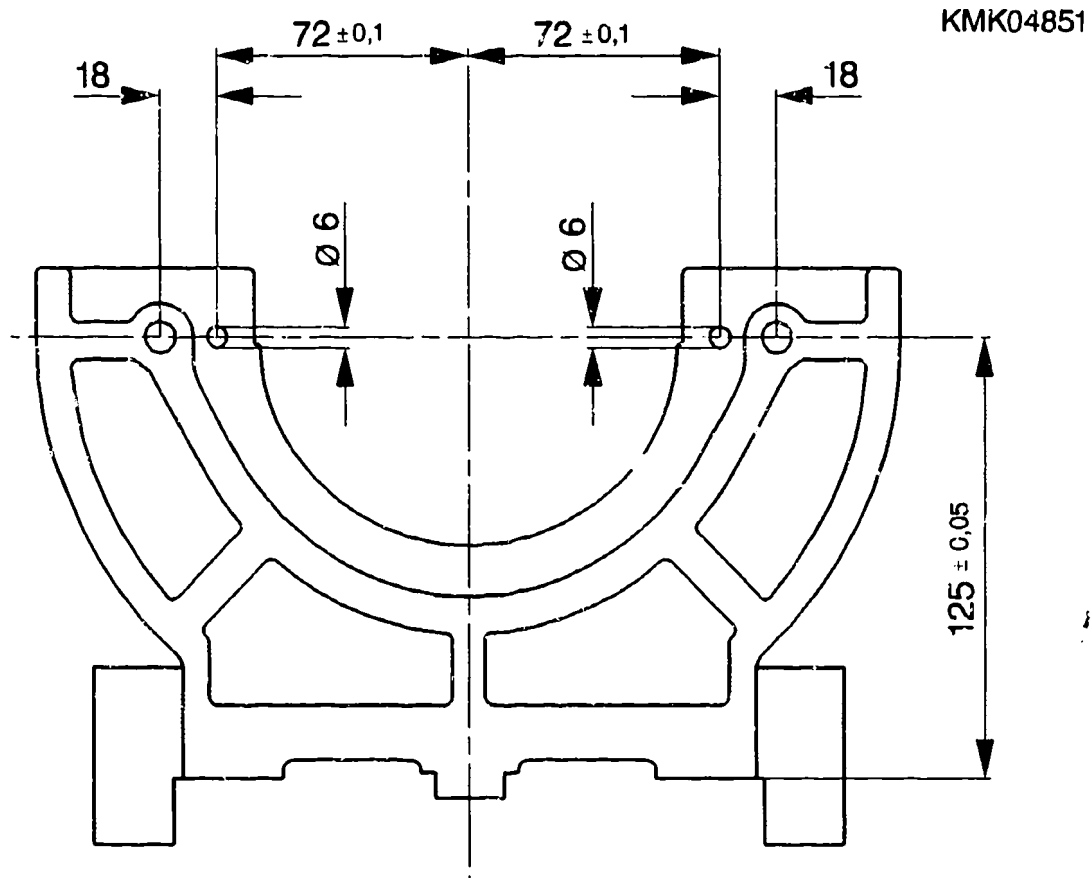
The following clamping components must be converted by the user:

Clamping bracket				Spring pins required			
=====							
1	688	010	124			---	
1	688	010	129			---	
=====							

Clamping flange				Spring pins required			
=====							
1	685	720	014		2	x	2 917 760 120
1	685	720	015		2	x	2 917 760 120
1	685	720	016		2	x	2 917 760 120
=====							

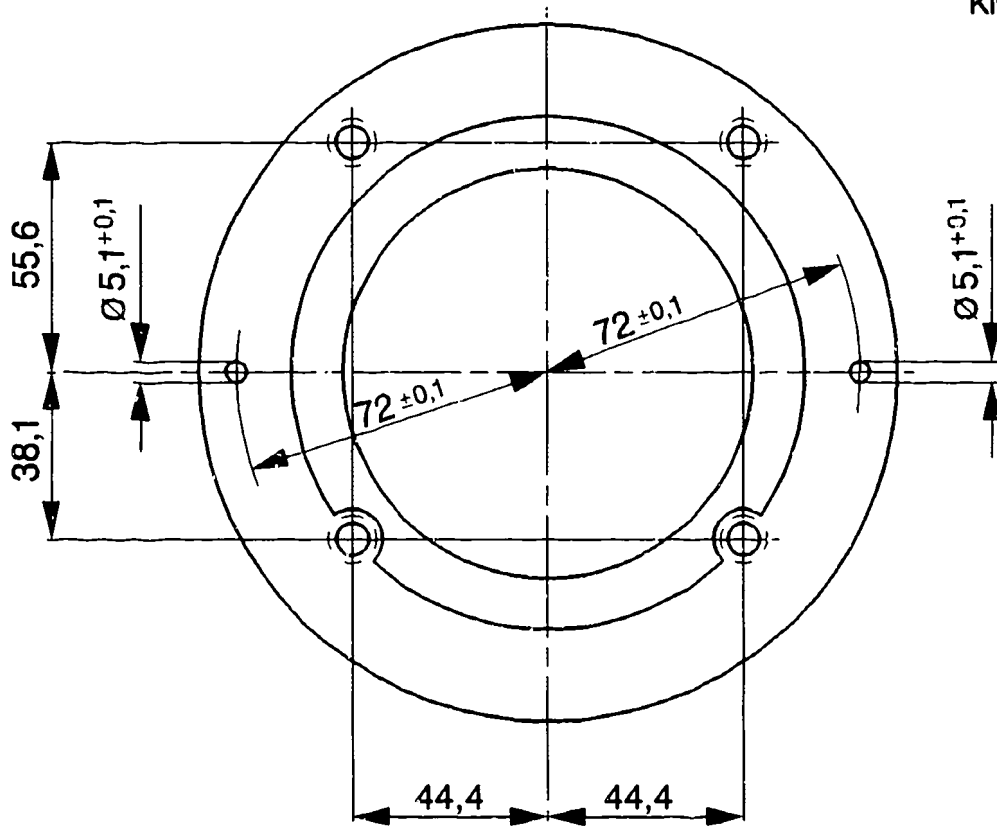
Clamping flange				Spring pins required						
=====										
1	685	720	017		2	x	2	917	760	120
1	685	720	018		2	x	2	917	760	120
1	685	720	019		2	x	2	917	760	120
1	685	720	060		2	x	2	917	760	120
1	685	720	062		2	x	2	917	760	120
1	685	720	066		2	x	2	917	760	120
1	685	720	069		2	x	2	917	760	121
1	685	720	077		2	x	2	917	760	120
1	685	720	087		2	x	2	917	760	120
1	685	720	159		2	x	2	917	760	120
1	685	720	208		1	x	2	917	760	120
1	685	720	210		1	x	2	917	760	116
=====										

Clamping bracket: 1 688 010 124
1 688 010 129



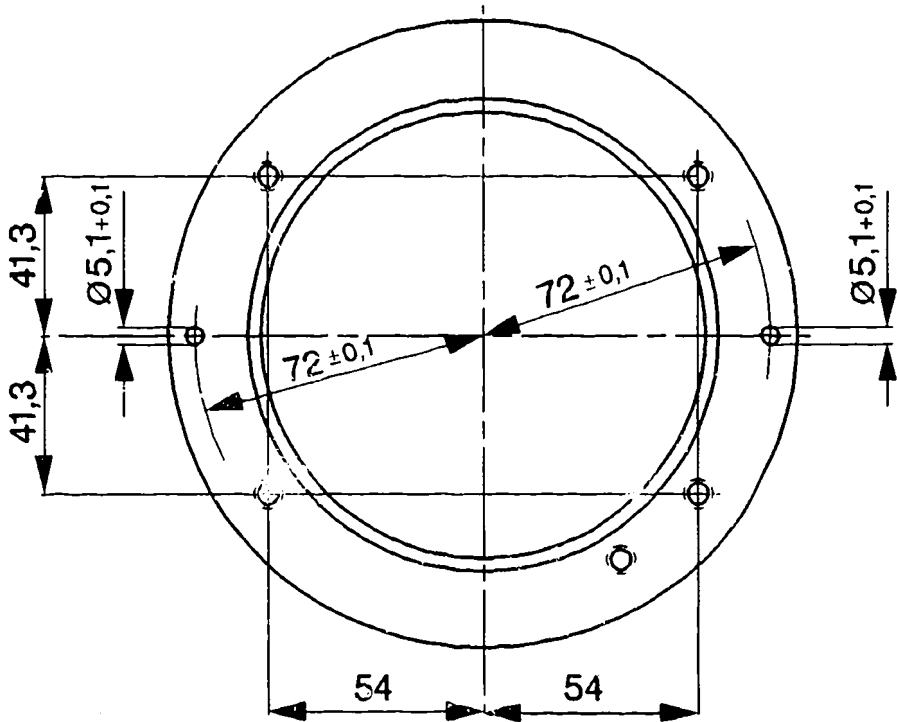
Clamping flange: 1 685 720 014

KMK04852



Clamping flange: 1 685 720 015

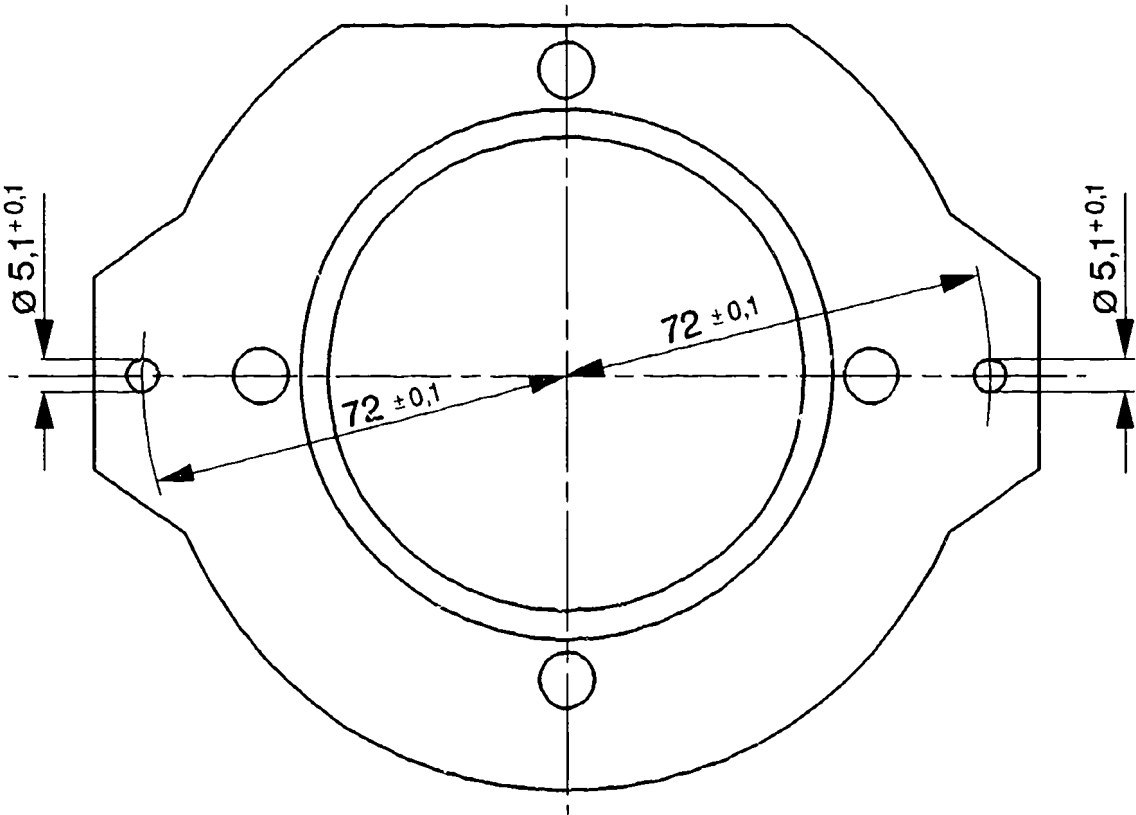
KMK04850



Clamping flange:

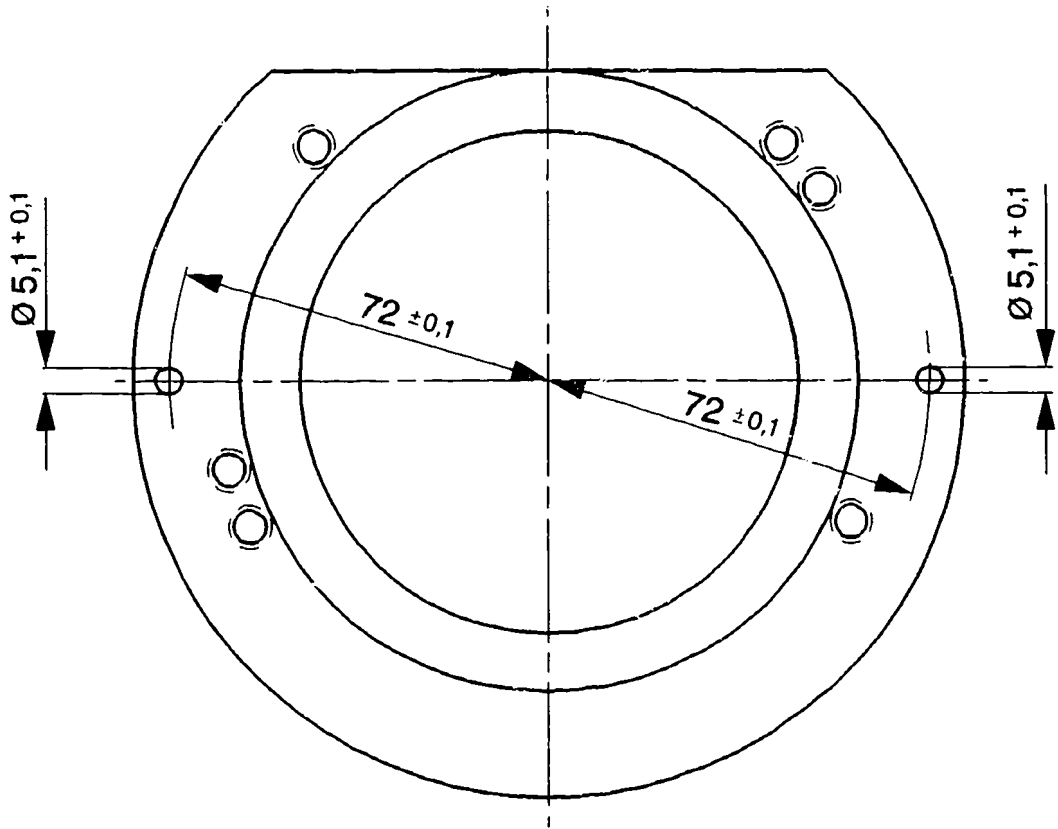
1	685	720	016
1	685	720	017
1	685	720	018
1	685	720	062
1	685	720	069
1	685	720	087

KMK04853



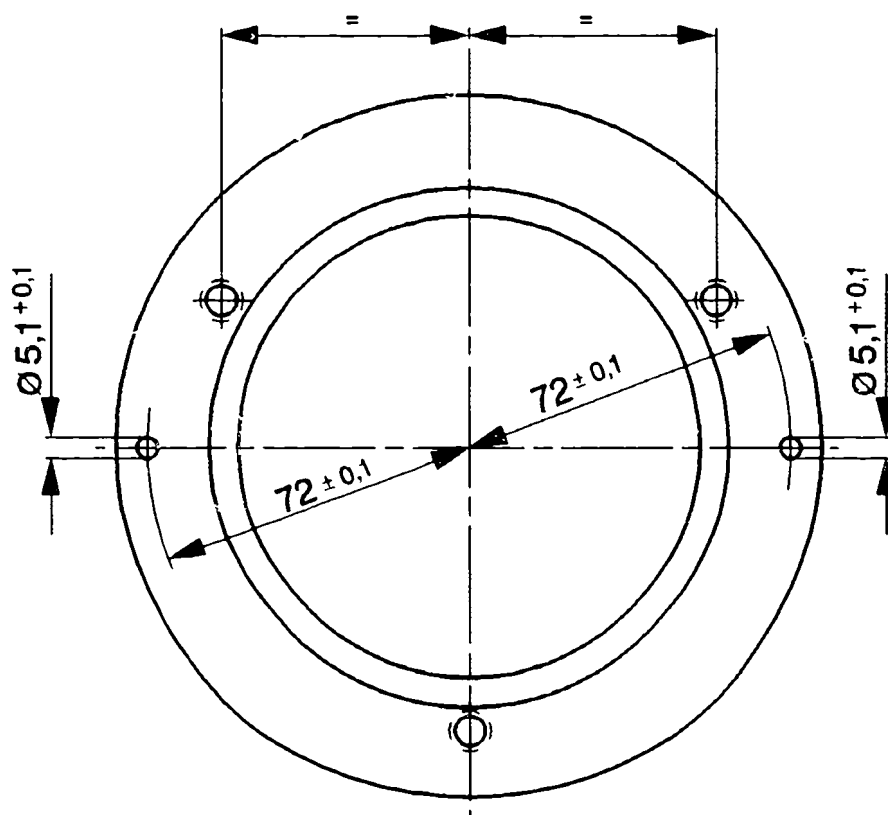
Clamping flange: 1 685 720 060
1 685 720 159

KMK04854

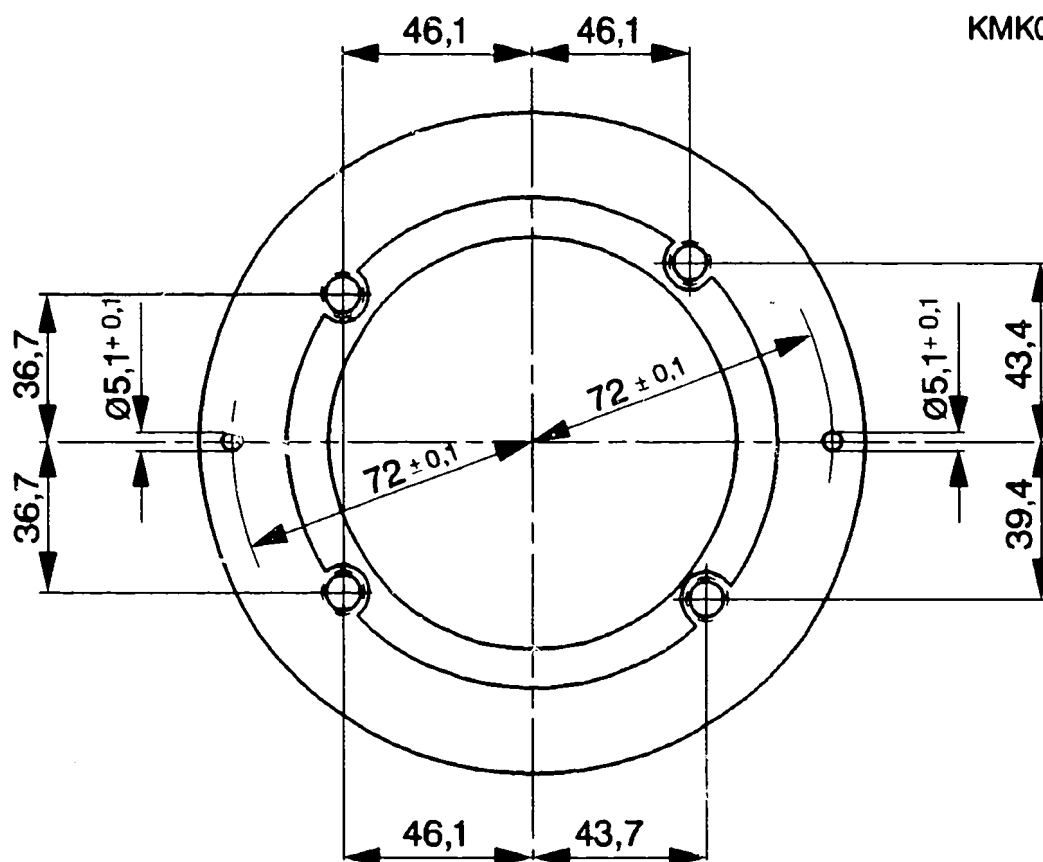


Clamping flange: 1 685 720 066

KMK04855

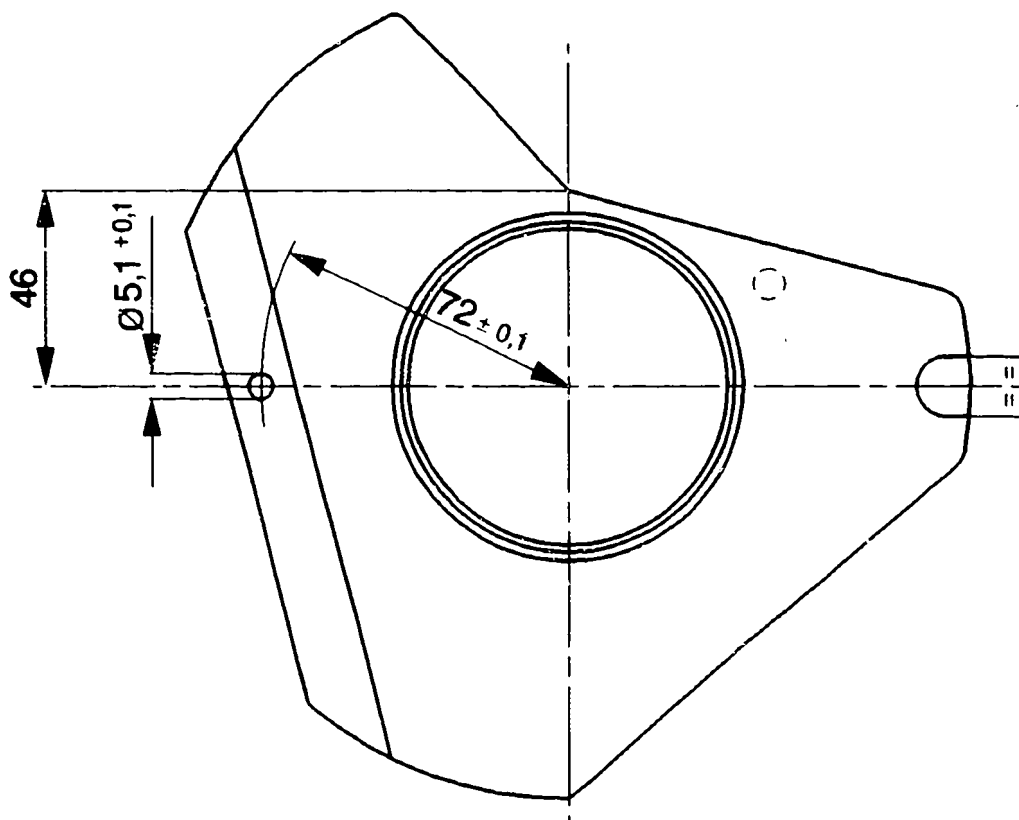


Clamping flange: 1 685 720 077



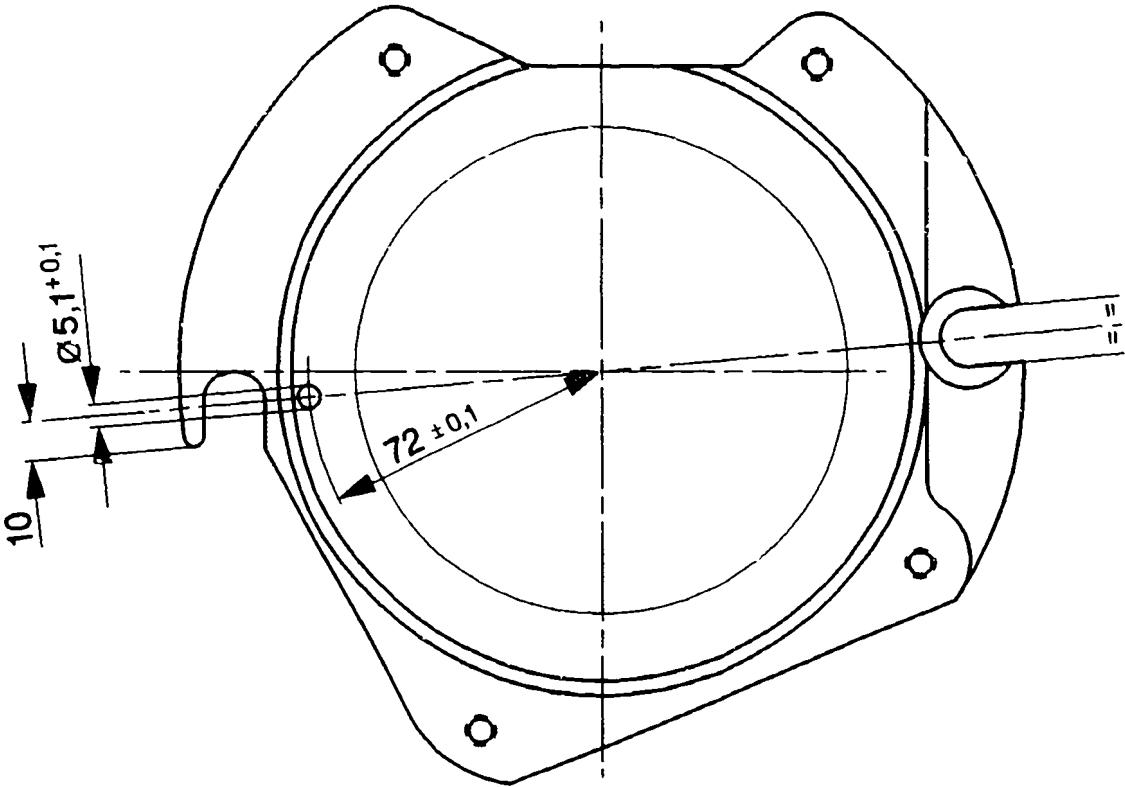
Clamping flange: 1 685 720 208

KMK04857



Clamping flange: 1 685 720 210

KMK04858



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**ZEXEL FUEL-INJECTION
PUMPS**

**Workshop: EP
06.1994
0397 En**

**Notes on service-parts lists
and test-specification sheets**

When checking ZEXEL fuel-injection pumps the part number of the pump may not tally with the number on the test-specification sheet. E.g.: 104740-3831 on the pump and 104740-3822 on test-specification sheet.

If this is the case, ZEXEL has made a technical modification which does not affect the test specifications.

The number (original ZEXEL part no.) of the pump to be checked can be found in the Contents WP-01; the coordinate reference then automatically applies to the correct test-specification sheet.

As regards IP service-parts lists recoding to Bosch part numbers is still required. For this purpose use must always be made of the part number on the pump (not the number on the test-specification sheet).

When enquiring about service parts and test specifications for ZEXEL VE-pumps always employ the 104 7xx-xxxx number given on an additional plate. The 104 6xx-xxxx number stamped in the housing can only be recoded with the help of ZEXEL Japan. It may then take several days to deal with your enquiries.

Missing test specifications are to be requested under the usual telephone/fax numbers from:

KH/VSK1 in Wernau,

and missing service-parts lists from:

KH/VKD6 in Karlsruhe.

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Division KH

After-Sales-Service Department for
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IN-LINE PUMPS/GOVERNOR Workshop: EP
COMBINATIONS AND DISTRIBUTOR- 06.1994
TYPE FUEL-INJECTION PUMPS 0413 En

Start of delivery settings

This Service Info lists start of
delivery settings for

- * In-line pumps/governor combinations
and
- * Distributor-type fuel-injection pumps
as a supplement to the test specifi-
cation sheets already published.

In-line pumps/governor combinations

0 403 466 113 3915686
Start of delivery: 11 degrees after
start of delivery, barrel 1

0 403 466 121 3280646
Start of delivery: 9 degrees after
start of delivery, barrel 1

9 400 230 093 3909986
Start of delivery: 11 degrees after
start of delivery, barrel 1

9 400 230 098 3909940
Start of delivery: 11 degrees after
start of delivery, barrel 1

0 401 276 049 RE23751
Start of delivery: 15 degrees after
start of delivery, barrel 1

0 402 076 005 AR53354
Start of delivery: Mark at start of
delivery, barrel 1

0 402 076 006 AR58571
Start of delivery: Mark at start of
delivery, barrel 1

0 402 076 007 AR64215
Start of delivery: Mark at start of
delivery, barrel 1

9 400 230 007 AR88752
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 008 AR88756
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 230 010 AR88757
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 012 AR87313
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 013 AR87584
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 230 020 AR90335
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 023 AR94030
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 026 AR96349
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 029 AR98069
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 040 AR105618
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 041 AR102178
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 042 AR100926
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 044 AR100240
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 045 AR100928
Start of delivery: 16.0 degrees after
start of delivery, barrel 1

9 400 230 046 RE10472
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 064 RE13406
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 065 RE154665
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 230 069 RE16222
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 230 071 RE18163
Start of delivery: 14.5 degrees after
start of delivery, barrel 1

9 400 230 072 RE18161
Start of delivery: 15.5 degrees after
start of delivery, barrel 1

9 400 230 078 RE19916
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 004 AR79958
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 005 AR88762
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 008 AR88764
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 011 AR88758
Start of delivery: 13.25 degrees after
start of delivery, barrel 1

9 400 231 043 AR93102
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 045 AR94263
Start of delivery: 12.5 degrees after
start of delivery, barrel 1

9 400 231 067 AR97431
Start of delivery: 13.25 degrees after
start of delivery, barrel 1

9 400 231 098 AR96835
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 102 AR94364
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 106 AR105421
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 106 AR105421
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 108 AR105617
Start of delivery: 13.25 degrees after
start of delivery, barrel 1

9 400 231 110 AR103263
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 129 AR105479
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 151 RE12198
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 160 RE16144
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 162 RE13794
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 163 RE16508
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 174 RE13056
Start of delivery: 14.0 degrees after
start of delivery, barrel 1

9 400 231 175 RE12944
Start of delivery: 12.75 degrees after
start of delivery, barrel 1

9 400 231 189 RE18947
Start of delivery: 15.0 degrees after
start of delivery, barrel 1

9 400 231 195 RE18156
Start of delivery: 11.5 degrees after
start of delivery, barrel 1

9 400 231 197 RE19728
Start of delivery: 13.0 degrees after
start of delivery, barrel 1

9 400 231 204 RE23749
Start of delivery: 13.0 degrees after
start of delivery, barrel 1

9 400 231 205 RE18152
Start of delivery: 13.0 degrees after
start of delivery, barrel 1

Distributor-type fuel-injection pumps

0 460 406 062 C0147046522
Start of delivery: 0.98 mm, port A

0 460 424 007 3903356
Start of delivery: 2.0 mm, port A

0 460 424 008 3903355
Start of delivery: 2.0 mm, port A

0 460 424 008 3907641
Start of delivery: 2.0 mm, port A

0 460 424 010 3903357
Start of delivery: 2.0 mm, port A

0 460 424 011 3903360
Start of delivery: 2.0 mm, port A

0 460 424 011 3917655
Start of delivery: 2.0 mm, port A

0 460 424 012 3903590
Start of delivery: 2.0 mm, port A

0 460 424 015 3903353
Start of delivery: 1.8 mm, port A

0 460 424 015 3903353
Start of delivery: 1.8 mm, port A

0 460 424 016 3906631
Start of delivery: 1.8 mm, port A

0 460 424 018 3904532
Start of delivery: 2.0 mm, port A

0 460 424 027 3910678
Start of delivery: 1.66 mm, port A

0 460 424 028 3909406
Start of delivery: 1.55 mm, port A

0 460 424 031 3908391
Start of delivery: 1.2 mm, port A

0 460 424 033 3909592
Start of delivery: 1.55 mm, port A

0 460 424 061 3917035
Start of delivery: 1.8 mm, port A

0 460 426 035 3903364
Start of delivery: 1.5 mm, port D

0 460 426 038 3903363
Start of delivery: 1.6 mm, port D

0 460 426 041 3904543
Start of delivery: 1.5 mm, port D

0 460 426 043 3903365
Start of delivery: 1.5 mm, port D

0 460 426 044 3903367
Start of delivery: 1.5 mm, port D

0 460 426 045 3904539
Start of delivery: 1.5 mm, port D

0 460 426 046 3904980
Start of delivery: 1.6 mm, port D

0 460 426 047 3904537
Start of delivery: 1.5 mm, port D

0 460 426 049 3903370
Start of delivery: 1.5 mm, port D

0 460 426 050 3904536
Start of delivery: 1.5 mm, port D

0 460 426 051 3904538
Start of delivery: 1.5 mm, port D

0 460 426 052 3904533
Start of delivery: 1.5 mm, port D

0 460 426 053 3904540
Start of delivery: 1.5 mm, port D

0 460 426 055 3904535
Start of delivery: 1.5 mm, port D

0 460 426 056 3906459
Start of delivery: 1.5 mm, port D

0 460 426 058 3904544
Start of delivery: 1.6 mm, port D

0 460 426 060 3907643
Start of delivery: 1.85 mm, port D

0 460 426 060 3908219
Start of delivery: 1.85 mm, port D

0 460 426 064 3908212
Start of delivery: 1.5 mm, port D

0 460 426 071 3908199
Start of delivery: 1.3 mm, port D

0 460 426 076 3908206
Start of delivery: 1.5 mm, port D

0 460 426 077 3908578
Start of delivery: 1.1 mm, port D

0 460 426 080 3908211
Start of delivery: 1.5 mm, port D

0 460 426 087 3904728
Start of delivery: 1.85 mm, port D

0 460 426 165 3917556
Start of delivery: 1.5 mm, port D

0 460 494 213 C0147046220
Start of delivery: 0.98 mm

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PES 6 P...

Workshop: EP

Subject:

06.1994

P7100 w/RE30 - Camshaft

0415 En

Breakage at Tone Wheel Drive Taper

Combination Numbers:

0 402 796 800, ...802, ...805 used on
Mack E7 Engines

Manufacturing Dates:

Up to 266 (June 1992)

If, because of breakage at the tone wheel drive taper, it becomes necessary to replace the camshaft in the above combinations, we recommend that camshaft 2 416 156 289, manufactured with a diameter 20 mm tone wheel drive taper, is substituted for camshaft 2 416 156 130 which is manufactured with a diameter 17 mm drive taper.

Camshaft 2 416 156 289 requires tone wheel 2 412 200 024 and retaining nut 2 423 314 006. Be certain to order these along with the camshaft.

As always, be certain to degrease and dry the tapers when fitting the tone wheel to the camshaft, and to test the assembly for slippage.

The proper torque for the tone wheel retaining nut on camshafts with diameter 20 mm tone wheel drive tapers is 90 + 10 Nm.

Standard warranty terms apply.

Thank you for your continued support of Bosch products.

ROBERT BOSCH Corporation
Service Department
Automotive Diesel Products
(UA/ASV)

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PES 6 P...

Workshop: EP

06.1994

Subject:

0416 En

P-7100 w/RE30 Used on Mack

E7 Engines - Tone Wheel Slippage

When servicing RE30 actuators for tone wheel slippage, be certain to follow the SIS procedures that cover the mounting of the tone wheel and the check for slippage.

The current location for these procedures is on card W400/019 C25-D13.

It is particularly important that you degrease the mounting tapers of the camshaft and tone wheel and that the parts are dry when assembled. Refer to DSD SL 91-08 for a recommended degreasing agent. Be certain to apply the correct torque.

17 mm taper: 80 + 10 Nm

20 mm taper: 90 + 10 Nm

Should you determine that the tone wheel needs replacement on a 17 mm tone wheel/camshaft assembly (i.e. tone wheel 2 412 200 016, camshaft 2 416 156 130), we recommend that you install tone wheel 2 412 200 011 in place of 2 412 200 016.

Standard warranty terms apply.

ROBERT BOSCH Corporation
Service Department
Automotive Diesel Products
(UA/ASV)

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PES 6 P...

Workshop: EP

06.1994

0417 En

Subject:

New Execution Tamper Seals
used on RE30 (EDC) and RQV-K
Governors for Mack E7 Engines

As a running change, various tamper seals have been installed on the above governors. When servicing these governors, be sure to replace the type of seal originally supplied with the pump. Following are illustrations of the seals and where they are installed.

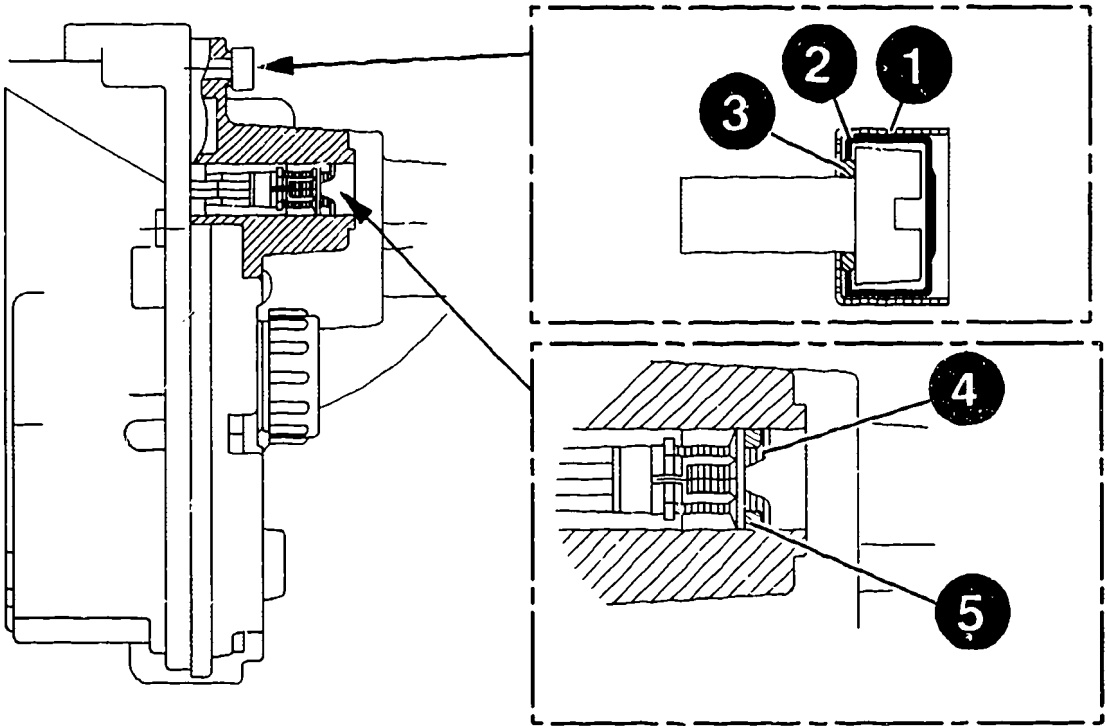
Cover/Housing Seal

Pos 1	2	420	505	014
Pos 2	2	420	508	003
Pos 3	2	420	200	021

Rack Position Seal

Pos 4	2	420	591	007
Pos 5	2	420	210	037

KMK05346



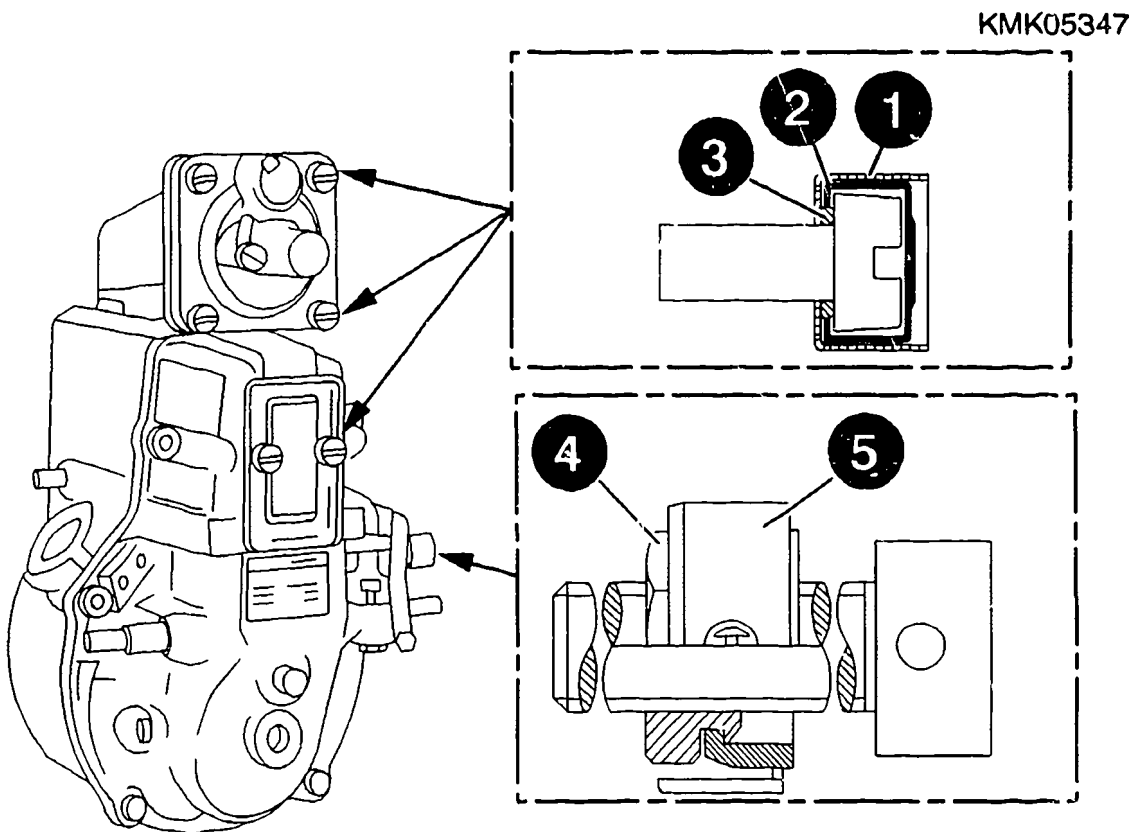
RQV-K

Cover/Housing Seal

Pos 1	2	420	505	014
Pos 2	2	420	508	003
Pos 3	2	420	200	021

Full Load Stop Seal

Pos 4	2	423	315	007
Pos 5	2	420	580	005



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Service Department
Automotive Diesel Products
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IP-ASSEMBLY
0 402 646 948
FOR VOLVO MARINE ENGINE
TAMD 72 A

002.94 En
06.1994

Unstable load take-up at low idle

Poor load take-up may be encountered at low idle on the above-mentioned engine with Bosch injection-pump assembly 0 402 646 948 (Volvo Penta No. 864 823).

The engine speed may fluctuate considerably and/or the engine may cut out.

This applies to fuel-injection pumps up to August 1993 (including FD 368). As of September 1993 (FD 369) series production was switched to the IP assembly 0 402 646 632 which features improved control in the idle range.

If complaints are received about engines with fuel-injection pumps prior to FD 369, the situation can be remedied by converting the existing pumps to the new design.

Old design

0 402 646 948
RQV 300...1300 PA 1003 K
0 421 815 281

New design

0 402 646 632
RQV 300...1300 PA 1094 K
0 421 815 364

Parts required for conversion:

Designation	Qty.	Bosch Part No.
Flyweight assy.	1	2 428 199 041
Spring seat	2	9 428 270 064
Pressure spring	2	9 428 270 067
Pressure spring	2	2 424 634 026
Pressure spring	2	2 424 618 057
Spring seat	2	1 420 520 013
Shim	4	1 200 102 624
Shim	4	9 428 270 068

The HP plate 2 420 101 027 from the
"old" governor is used in the
"new" one as well.

After conversion, the name plates are to be altered in line with the latest version or replaced.

Use can be made for this purpose of the following name plates:

Pump:	1	901	100	001
Governor:	1	421	100	015

Note on pump adjustment

For optimum load take-up the sliding-sleeve travel profile should be set where possible to the upper positive tolerance.

A check is further to be made on the pump scatter at the idle point 300 min-1 and adjustment performed where necessary in line with the test specification sheet.

Such conversion work does not constitute a warranty situation and the costs are to be billed to the customer.

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R-PUMP WITH
EDC POSITIONER RE 31

Workshop: EP
09.1994
0418 En

General repair and
testing instructions

This Service Info contains information
on repair and testing of the in-line
pump of size "R" with EDC positioner
RE 31.

PUMP REPAIR

Repair instructions for the R-pump
are given on the microcard W-400/050.

New service tools are listed in the
tools catalog. These tools are also
outlined in the repair instructions
in the section headed "TESTERS,
FIXTURES and TOOLS".

REPAIRS TO RE 31 POSITIONER

Repairs to the RE 31 positioner are to be carried out on the basis of the repair instructions for RE 24/RE 30 positioners (see ULV W-400/000 under: Governor, repair, "RE 24/30 governor positioners on P-pumps").

On account of larger tolerances and a different component arrangement (inclined position of speed sensor) the following service tools had to be newly established:

REPAIRS TO RE 31 POSITIONER

- * Feeler gauge 0 986 612 664
Position of speed pulse generator in positioner cover, checking/adjusting
- * Setting gauge 0 986 612 669
Position of RPS shorting ring at control rod, checking
- * Retaining plate 0 986 612 675
Assignment of pulse wheel
(Replacement of existing retaining plate of holding device 0 986 612 305 (KDEP 1702) with retaining plate 0 986 612 675)

PUMP TESTING

Testing of the R-pump is to be performed using the P-pump instructions.

Compliance with the torsion limit in ISO 4008/1 has led to new development of the following drive components:

- * Drive flanges
- * Intermediate flange
- * Drive coupling
- * Protection device

The pump is ONLY to be driven with the stated drive components!

PUMP TESTING

A modified center height and different clamping dimensions have also made new clamping supports necessary.

Part nos. for drive components and clamping frames are given in the IA4 Information:

" IA4 - VJF7 / 9205 " (file VK 3).

TESTING RE 31 POSITIONER

Testing of the RE 31 positioner is to be performed on the basis of the test instructions for RE 24/RE 30 positioners (refer to ULV W-400/000 under: Governor, testing, "RE 24/30 governor positioners on P-pumps").

All test procedures can be employed as described in the microcard.

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**BOSCH FUEL-INJECTION PUMPS
OF SIZE H
(CONTROL-LEVER IN-LINE PUMPS)**

**004.94 En
09.1994**

Service procedure

The in-line pump concerned is the control-lever type with electronic control of injected quantity and start of delivery.

Type designation:	Bosch part no.
PE 8 H 120/320 LS3	0 402 698 031
PE 6 H 120/320 LS4	0 402 696 031

Service procedure:

Warranty for Bosch fuel-injection pumps in Mercedes-Benz trucks is handled with the agreement of Mercedes-Benz via the Bosch service organization.

Up until approx. October 1994 customers will be provided free of charge with a replacement pump via the Bosch service organization in the event of complaints. If necessary the Bosch service organization can order a replacement pump with express delivery. The Bosch service organization is credited in the usual warranty manner.

Note:

As of approx. 10/94 EDC in-line pump service stations will be in a position to check/repair the pump.

It will be possible to check the pump at an EDC in-line pump service station with existing testers on a test bench. New tools will be available as of 9/94 for repairing the pump. EDC in-line pump service stations will be receiving appropriate information.

Control-lever in-line pumps subject to complaint are to be submitted up until approx. October 1994 to the following addresses

- * In Germany together with warranty voucher G20 to:

Robert Bosch GmbH
FeW/LOG3-Auspackraum
zur Weiterleitung an K5/QSG1
Am Boschwerk
D - 70 469 Stuttgart

- * In all other countries:

Together with warranty voucher G21 to local Bosch representative for forwarding to K5/QSG1.

Pumps submitted will be inspected by Bosch. Bosch service stations in Germany will receive a test report from K5/QSG1, or via the local Bosch representative in all other countries.

Important:

Service situations involving control-lever in-line pumps are to be given top priority. When required, Bosch service stations are therefore to order the control-lever pump in the usual manner with express delivery stipulating "urgent service requirement".

All Bosch service employees responsible for diesel service and service parts are to be informed accordingly.

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Technical After-Sales Service

(KH/VKD 2)

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TIMING DEVICE FAILURE

005.94 En

09.1994

on MAN comm. veh.

with engines D0826LF04 and ..LUH01

* IP assemblies involved:

	BOSCH	MAN
0	403 456 115	51.11103-7126
0	403 456 116	51.11103-7137
0	403 456 117	51.11103-7138

* Nozzle-and-holder assemblies:

0	432 131 820	51.10101-7349
---	-------------	---------------

Foreign matter can ingress into the injection system as a result of fractures at the reverse-current choke and cause an impermissible increase in pressure, thus possibly causing the timing device flyweights to break.

Period concerned FD 261 - 369

In the event of timing device failure, replace injection-pump and all nozzle-and-holder assemblies. Inspect injection tubing for foreign matter.

In cases of damage enter fault code
A05 in field for plain-language fault
text on warranty claim.
Send assemblies affected to the address
given below.

* In Germany:

Robert Bosch GmbH
FeW/LOG1 z.W.an FeW/LOG3
Auspackraum Bau 395
Am Boschwerk
D-70469 Stuttgart

* In all other countries:

To the local Bosch representative
for forwarding to K5/QSG2.

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**BOSCH IN-LINE PUMP
SIZE "R"**

**Workshop: EP
12.1994
ST 0432 En**

New service procedure

As of 11.91 BOSCH in-line pumps were extended to include size "R".

To date, the service concept has not foreseen a dense service network for individual repair at BOSCH service stations on account of the relatively limited distribution of this new type.

Further applications and customers have since been established for the R-pump which is available both with electronic positioner (RE 31) and with RQV governor.

As of now, R-pump servicing is thus to be handled decentrally via BOSCH diesel service stations in exactly the same manner as for other BOSCH injection pumps.

The test and repair instructions for the R-pump will be published on SIS microcard 09.94, the test specifications on the WP microcards.

The service tools are listed in the R-pump instructions and are to be procured in the usual manner. The normal warranty conditions apply.

IMPORTANT:

With the agreement of our customers, we would ask that the following be observed prior to pump replacement:

In the event of complaints about fuel consumption and/or lack of power the vehicle/engine must be completely checked in line with the service instructions of the vehicle/engine manufacturer.

We should like to take this opportunity of pointing out once again that the cleaning of injection nozzles with a steel brush is not permitted.

This deforms the holes and alters the flow values to such an extent that complaints may be received about performance, consumption and smoke. In such cases the complaints could be rectified by replacing the nozzles.

R-pump service is to be given top priority.

Where needed, BOSCH service stations should therefore order the R-pump/ necessary parts with the note

"Urgent service requirement"

in the usual express-shipment manner.

All BOSCH service station staff responsible for diesel service and parts are to be informed accordingly.

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**DIESEL FUEL-INJECTION
PUMPS**

**Workshop: EP
12.1994
ST 0421 En**

**Telephone enquiries concerning
IP test specifications and conversion**

There has recently been a considerable increase in the number of enquiries concerning IP test specifications and governor conversion. We are currently dealing with more than 600 BD enquiries every month.

In order to be able to deal with these enquiries as quickly as possible in your own interest, we would ask you once again to adhere to the procedures described below.

Test specifications:

If adjustment is necessary following IP repair, a check should be made PRIOR TO repair as to whether the test specifications are contained in the WP microcards, so as to make for immediate ordering where necessary.

Governor conversion:

Please make use of the form

**"Enquiry concerning conversion of
IP assembly"**

**so as to avoid time-consuming
enquiries on our part. Without this
form we cannot process your enquiry
for legal reasons.**

Note:

**Experience has shown that the
processing of enquiries in conjunction
with various Bosch departments and
vehicle manufacturers can often take
several hours or even days in
exceptional circumstances where
conversion is concerned. Please take
this into account as regards your job
planning.**

- * IP enquiries can be made at any time in Germany by contacting KH/VSK in Wernau using the usual telephone numbers (answering machine outside business hours) or by way of the Fax no. 07153/306-714.
- * Outside Germany, IP enquiries are to be addressed to your local BOSCH representative.

Published by:

Robert Bosch GmbH
Division KH
After-Sales-Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country

PE 8 P... WITH RE 30

Workshop: EP

12.1994

Scania commercial vehicles
with EDC

ST 0422 En

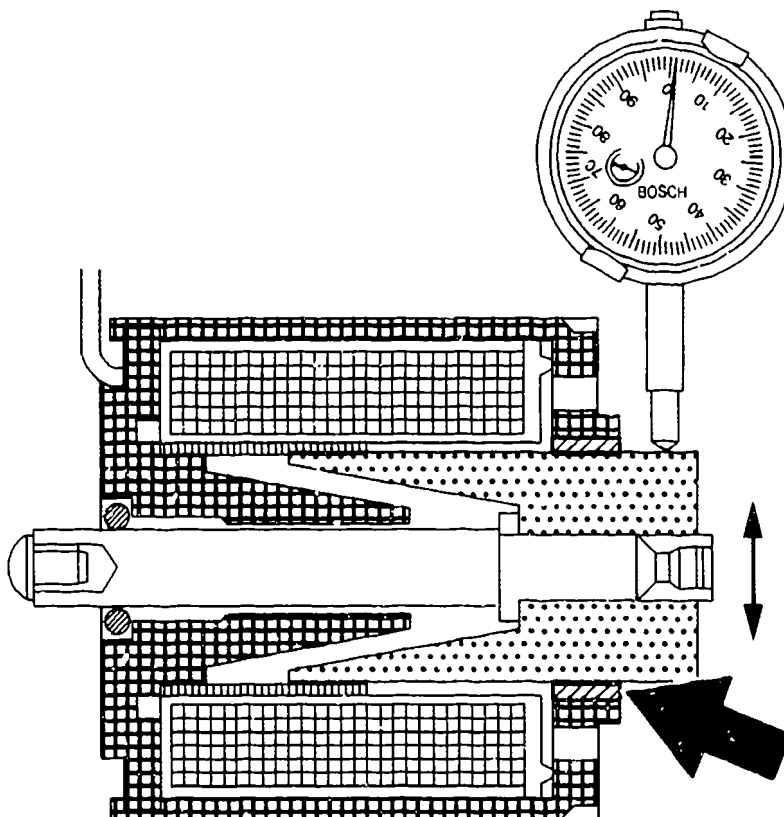
IDLE INSTABILITY

Complaint: Unstable idle-speed control behavior is sometimes encountered on Scania commercial vehicles featuring the 8-cylinder engine series DSC 14..and EDC. In the event of extreme instability, the self-diagnosis indicates fault 10 "Permanent deviation". This fault may occur on vehicles from all model years since the start of series production in 1989.

Cause of trouble:

The problem is usually caused by a stiff electromagnet armature in the adjusting magnet of the RE positioner due to one-sided wear of the large electromagnet-armature bushing (picture, arrow).

Such wear cannot be detected during normal testing of the IP assembly on an IP test bench. For this reason, should such complaints be received, the adjusting magnet is to be removed and the bearing wear measured.

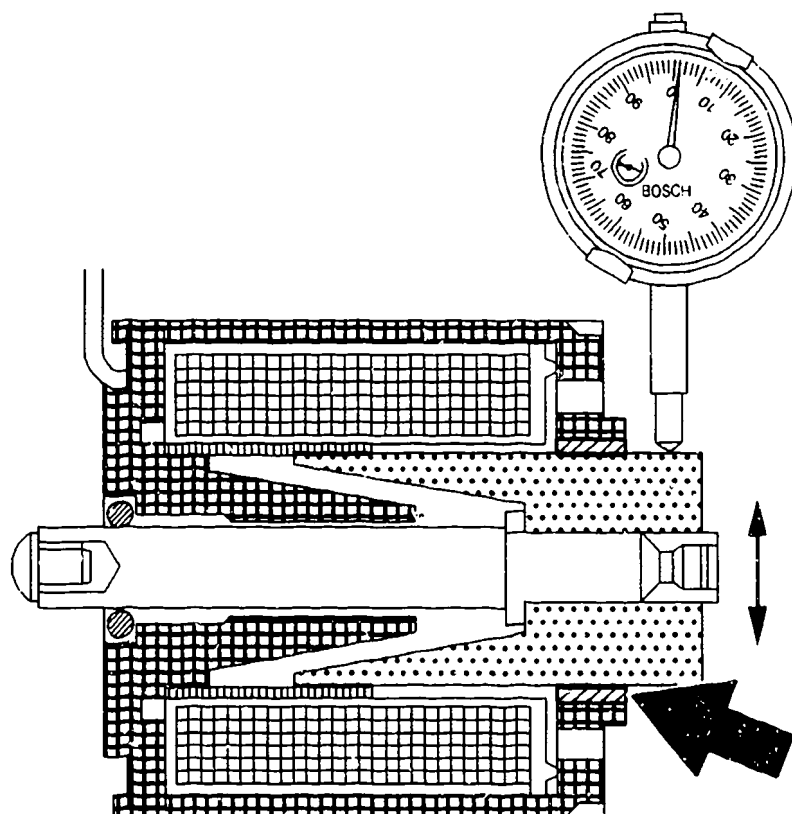


KMK03078

Fault determination and correction:

The following work is based on the repair and test instructions for RE positioners VDT-W-400/019, the information in which is to be precisely followed.

- Completely remove positioner cover.
- Unsolder electrical connections of control-rod-travel sensor and adjusting magnet at connection plate (pay attention to soldering specifications).
- Remove control-rod-travel sensor and adjusting magnet.
- Check large bushing in adjusting magnet (arrow) for wear.



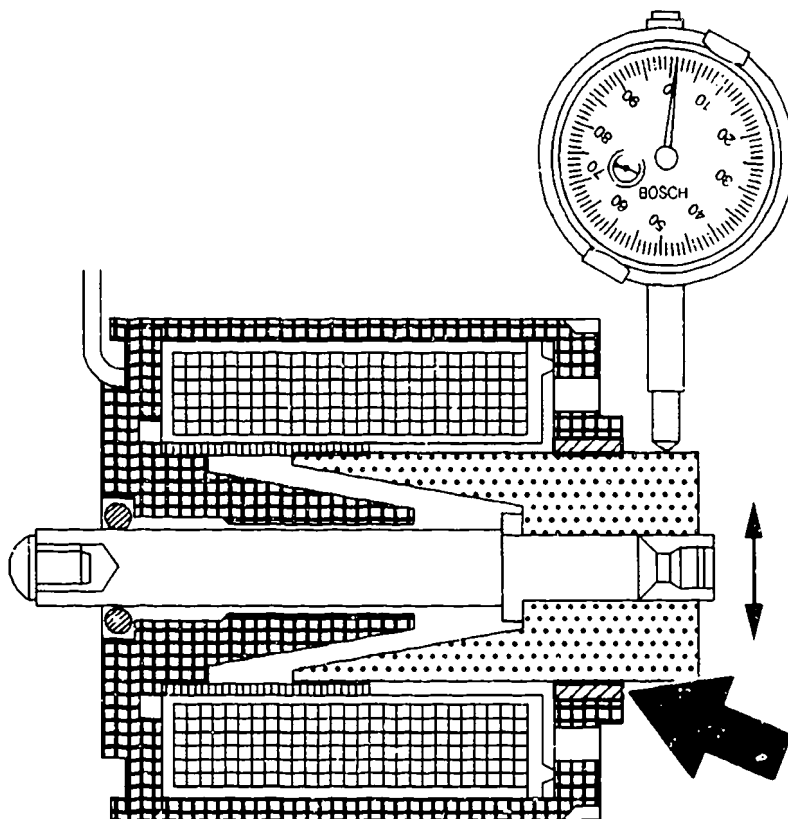
KMK03078

Checking bearing clearance:

Tools required:

- Prism for holding adjusting magnet
- Stand, commercially available,
e. g. Bosch 4 851 601 124
- Dial indicator, 0.01 mm
graduations, commercially available,
e.g.. Bosch 1 687 233 011

Procedure: Place magnet in prism.
Pull electromagnet armature somewhat
out of housing and align dial
indicator at armature directly
adjacent to large bushing. Move
armature in vertical direction within
bearing clearance; in doing so, turn
magnet in prism to several positions
and establish maximum bearing
clearance.



KMK03078

The max. bearing clearance for the large bushing is 0.12 mm.

The adjusting magnet is to be renewed if the limit value is exceeded.

The magnet and control-rod-travel sensor are to be installed and the positioner assembled on the basis of the repair instructions.

Attach injection pump to test bench. Set control-rod-travel sensor as per test instructions and check/adjust pump.

Warranty:

If the complaint described above is found to be the reason for a defective adjusting magnet, Bosch will grant goodwill up to a maximum of 200,000 km for a further year over and above the usual warranty period of one year with unlimited mileage.

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MW FUEL-INJECTION
PUMPS AS OF VERSION
CODE ..S 1510

Workshop: EP
12.1994
ST 0424 En

Instructions on how to set prestroke

This Service Info is designed to supplement the test instructions for MW fuel-injection pumps on microcard W-400/009.

MW fuel-injection pumps as of version code ..S 1510 feature a camshaft with a longer stroke (12 mm).

On account of further design modifications to engine components the camshaft is **n o t** to be turned through 360 Grad when adjusting prestroke with prestroke measuring device fitted.

After setting the prestroke at no. 1 cylinder with prestroke measuring device, the measuring device **m u s t** be removed prior to subsequent measurement of the angular cam spacing.

If the above is not observed,
the measuring-device drive and
parts of the fuel-injection pump
will be damaged.
Subsequent damage cannot be precluded
if use is made of a predamaged
fuel-injection pump.

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country

QUICK
LOCATION OF NEW
SERVICE INFO
ON MICROCARDS

Vehicle: PKW
12.1994
ST 0425 En

Service Info has been exclusively published on microcards since mid-1991. There is no longer a hard copy.

We are often asked where the latest Service Info is to be found, and on which microcards.

The latest Service Info always comes at the end of a given microcard so as to make for a rapid overview of the most important new features as required.

Microcards featuring Service Info are marked with an * on the record list.

Listed in the following for your reference are the current Service Info microcards which will be distributed as and where necessary:

Assembly shops

- 1. FZG-001** **Information from and for
Bosch Service Stations**
- 2. FZD-049** **Passenger and commercial-
vehicle info (Diesel only)**
- 3. KFZ-017** **Info concerning both pass-
enger and commercial veh-
icles (not brakes and
Diesel)**
- 4. PKB-050** **Brake-system info incl.
ABS for passenger and
commercial vehicles**
- 5. NKW-021** **Info exclusively for
commercial vehicles
(incl. Diesel)**

Assembly shops

- 6. PKW- 184** **Info exclusively for
passenger vehicles
(not brakes and Diesel)**
- 7. PKW-5001** **Info exclusively for
passenger vehicles with
mixed and non-Bosch
systems (not brakes and
Diesel)**

Repair shops

- 8. W-001/027 EL workshop info**
- 9. W-400/051 EP workshop info**
- 10. W-480/005 NB workshop info**

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PE(S)...P... WITH
EDC POSITIONER RE...

Workshop: EP
12.1994
ST 0429 En

Adjustment instructions

A detailed and full description of all test and adjustment procedures for EDC fuel-injection equipment PE(S)...P... with positioner RE... can be found on microcard VDT-W 400/019.

We would stress that the specifications given there for the DC voltmeter must be observed.

Voltmeter:

The microcard VDT-W 400/019 outlines the requirements in terms of basic DC accuracy in the list of testers, tools and devices for the voltmeter (digital multimeter):

- Deviation less than 0.1 % from reading.
- Resolution 0.001 V in measuring range up to approx. 4 V.

Compliance with these requirements is absolutely essential.

Voltmeter:

Our investigations into various events in recent times have shown that use has been made of measuring instruments with insufficient accuracy.

This results in considerable overshooting of the IP adjustment tolerances and thus leads to complaints about performance, engine power and consumption.

In worst-case situations the engine will not start. The stated accuracy requirements are satisfied, for example, by the multimeter "Fluke 87". The Bosch multimeter MMD 301 (0 684 500 301) is not capable of such accuracy and is therefore unsuitable.

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Robert Bosch GmbH
Division KH
After-Sales-Service Department for
Training and Technology (KH/VSK)

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IP-ASSEMBLY
0 402 646 948
FOR VOLVO MARINE ENGINE
TAMD 72 A

Workshop: EP
12.1994
ST 0436 En

Unstable load take-up at low idle

Poor load take-up may be encountered at low idle on the above-mentioned engine with Bosch injection-pump assembly 0 402 646 948 (Volvo Penta No. 864 823).

The engine speed may fluctuate considerably and/or the engine may cut out.

This applies to fuel-injection pumps up to August 1993 (including FD 368). As of September 1993 (FD 369) series production was switched to the IP assembly 0 402 646 632 which features improved control in the idle range.

If complaints are received about engines with fuel-injection pumps prior to FD 369, the situation can be remedied by converting the existing pumps to the new design.

Old design

0 402 646 948

RQV 300...1300 PA 1003 K

0 421 815 281

New design

0 402 646 632

RQV 300...1300 PA 1094 K

0 421 815 354

Parts required for conversion:

Designation	Qty.	Bosch Part No.
Flyweight assy.	1	2 428 199 041
Spring seat	2	9 428 270 064
Pressure spring	2	9 428 270 067
Pressure spring	2	2 424 634 026
Pressure spring	2	2 424 618 057
Spring seat	2	1 420 520 013
Shim	4	1 200 102 624
Shim	4	9 428 270 068

The HP plate 2 420 101 027 from the "old" governor is used in the "new" one as well.

After conversion, the name plates are to be altered in line with the latest version or replaced.

Use can be made for this purpose of the following name plates:

Pump: 1 901 100 001

Governor: 1 421 100 015

Note on pump adjustment

For optimum load take-up the sliding-sleeve travel profile should be set where possible to the upper positive tolerance.

A check is further to be made on the pump scatter at the idle point 300 min-1 and adjustment performed where necessary in line with the test specification sheet.

Such conversion work does not constitute a warranty situation and the costs are to be billed to the customer.

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**ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)**

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**BOSCH FUEL-INJECTION
PUMPS OF SIZE H
(CONTROL-LEVER
IN-LINE PUMPS)
Service procedure**

**Workshop: EP
12.1994
ST 0430 En**

The in-line pump concerned is the control-lever type with electronic control of injected quantity and start of delivery.

Type designation:	Bosch part no.
PE 8 H 120/320 LS3	0 402 698 031
PE 6 H 120/320 LS4	0 402 696 031

Service procedure:

Warranty for Bosch fuel-injection pumps in Mercedes-Benz trucks is handled with the agreement of Mercedes-Benz via the Bosch service organization.

Up until approx. October 1994 customers will be provided free of charge with a replacement pump via the Bosch service organization in the event of complaints. If necessary the Bosch service organization can order a replacement pump with express delivery. The Bosch service organization is credited in the usual warranty manner.

Note:

As of approx. 10/94 EDC in-line pump service stations will be in a position to check/repair the pump.

It will be possible to check the pump at an EDC in-line pump service station with existing testers on a test bench. New tools will be available as of 9/94 for repairing the pump. EDC in-line pump service stations will be receiving appropriate information.

Control-lever in-line pumps subject to complaint are to be submitted up until approx. October 1994 to the following addresses

- * In Germany together with warranty voucher G20 to:

Robert Bosch GmbH
FeW/LOG3-Auspackraum
zur Weiterleitung an K5/QSG1
Am Boschwerk
D - 70 469 Stuttgart

- * In all other countries:

Together with warranty voucher G21 to local Bosch representative for forwarding to K5/QSG1.

Pumps submitted will be inspected by Bosch. Bosch service stations in Germany will receive a test report from K5/QSG1, or via the local Bosch representative in all other countries.

Important:

Service situations involving control-lever in-line pumps are to be given top priority. When required, Bosch service stations are therefore to order the control-lever pump in the usual manner with express delivery stipulating "urgent service requirement".

All Bosch service employees responsible for diesel service and service parts are to be informed accordingly.

Published by:

**ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)**

**Please direct questions and comments
concerning the contents to our
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country**

TIMING DEVICE FAILURE
on MAN comm. veh.
with engines D0326LF04
and ..LUH01

Workshop: EP
12.1994
ST 0431 En

*** IP assemblies involved:**

	BOSCH	MAN
0 403 456 115		51.11103-7126
0 403 456 116		51.11103-7137
0 403 456 117		51.11103-7138

*** Nozzle-and-holder assemblies:**

0 432 131 820	51.10101-7349
---------------	---------------

Foreign matter can ingress into the injection system as a result of fractures at the reverse-current choke and cause an impermissible increase in pressure, thus possibly causing the timing device flyweights to break.

Period concerned FD 261 - 369

In the event of timing device failure, replace injection-pump and all nozzle-and-holder assemblies. Inspect injection tubing for foreign matter.

In cases of damage enter fault code
A05 in field for plain-language fault
text on warranty claim.
Send assemblies affected to the address
given below.

* In Germany:

Robert Bosch GmbH
FeW/LOG1 z.W.an FeW/LOG3
Auspackraum Bau 395
Am Boschwerk
D-70469 Stuttgart

* In all other countries:

To the local Bosch representative
for forwarding to K5/QSG2.

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Division KH
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**BOSCH IN-LINE PUMP
SIZE "R"**

**Workshop: EP
12.1994
ST 0432 En**

New service procedure

As of 11.91 BOSCH in-line pumps were extended to include size "R".

To date, the service concept has not foreseen a dense service network for individual repair at BOSCH service stations on account of the relatively limited distribution of this new type.

Further applications and customers have since been established for the R-pump which is available both with electronic positioner (RE 31) and with RQV governor.

As of now, R-pump servicing is thus to be handled decentrally via BOSCH diesel service stations in exactly the same manner as for other BOSCH injection pumps.

The test and repair instructions for the R-pump will be published on SIS microcard 09.94, the test specifications on the WP microcards.

The service tools are listed in the R-pump instructions and are to be procured in the usual manner. The normal warranty conditions apply.

IMPORTANT:

With the agreement of our customers, we would ask that the following be observed prior to pump replacement:

In the event of complaints about fuel consumption and/or lack of power the vehicle/engine must be completely checked in line with the service instructions of the vehicle/engine manufacturer.

We should like to take this opportunity of pointing out once again that the cleaning of injection nozzles with a steel brush is not permitted.

This deforms the holes and alters the flow values to such an extent that complaints may be received about performance, consumption and smoke. In such cases the complaints could be rectified by replacing the nozzles.

R-pump service is to be given top priority.

Where needed, BOSCH service stations should therefore order the R-pump/ necessary parts with the note

"Urgent service requirement"

in the usual express-shipment manner.

All BOSCH service station staff responsible for diesel service and parts are to be informed accordingly.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country

COMM. VEH. WITH EDC Motor vehicle: NKW
PE(S)..P.. and workshop : EP
WITH ELAB 12.1994
ST 0437 En

ELAB (electric shutoff device)
with aluminum housing;
housing leakage

Cracks in the ELAB housing of EDC-P
pumps may occasionally lead to leaks
with slight fuel discharge.
The procedure described below is
designed to enable such leaking ELAB
to be detected and replaced.

Note: The number of cases of ELAB
leakage to date is minimal. Checking
must therefore be performed very
conscientiously to avoid unnecessary
replacement.

The Service departments of the engine
manufacturers concerned have been
informed, so that leaking ELAB can
already be detected and replaced
at the dealers.

The situation relates to ELAB with aluminum housing produced between 3.91 (FD 163) and 5.94 (FD 465) and attached to injection pumps of engine manufacturers MAN, Scania and John Deere.

A list of the injection-pump assemblies concerned is given in the following:

Company	ELAB complete	Assembly
MAN	2 417 205 009	0 402 795 800
		0 402 796 803
		0 402 796 808

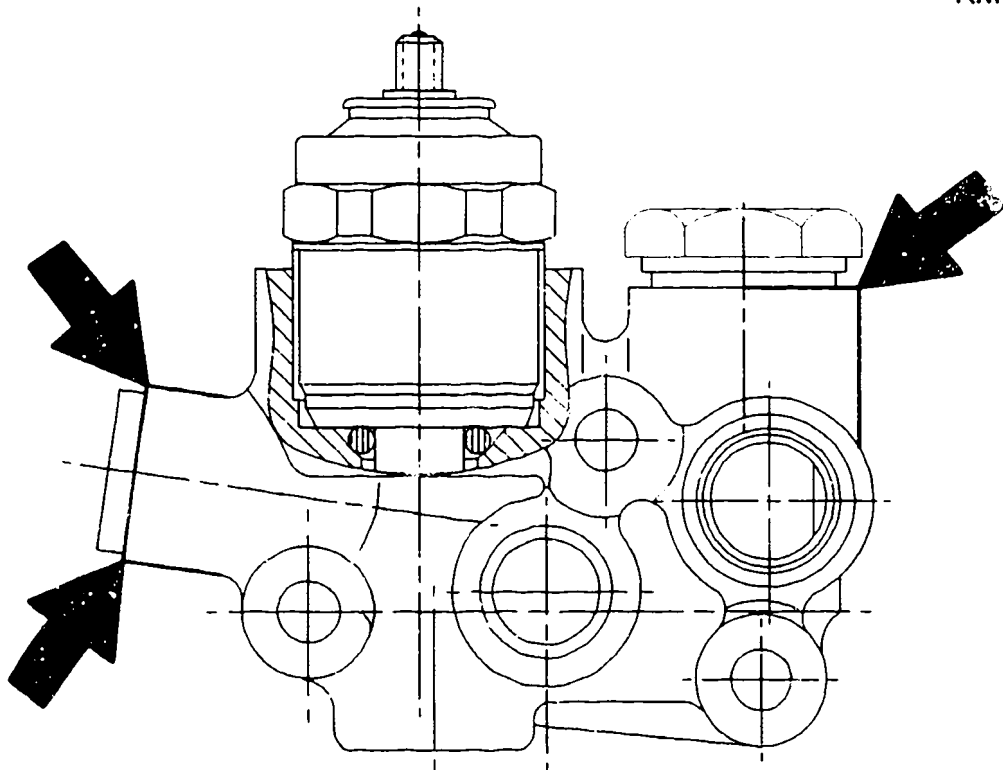
Company	ELAB complete	Assembly
Scania	2 417 205 004	0 402 696 801
		0 402 698 802
		0 402 698 804
		0 402 698 805
		0 402 698 806
		0 402 896 004
		0 402 896 013
		0 402 896 014
JOHN DEERE	2 417 205 005	0 402 196 700
		0 402 196 701
		0 402 196 702
		0 402 196 703
		0 402 796 809
		0 402 796 812

Measures:

If Bosch Service Stations have to deal with such pumps or vehicles with the pumps affected, a check is always to be made on the ELAB for traces of fuel leakage irrespective of the complaint. The entire ELAB is to be replaced if such traces are found.

Position of housing cracks resulting in leakage is shown by arrows in fig.

KMK05601



Disassembly of ELAB:

Note: ELAB removal/installation is possible with the injection pump in situ if accessibility is guaranteed.

- * Thoroughly clean ELAB, fuel-line connections and attachment area.
- * Unscrew fuel lines.
- * Remove electrical connection.
- * Loosen ELAB fastening nuts.
- * Catch fuel which emerges and remove ELAB from pump housing.

Assembly of new ELAB:

Always assemble new ELAB with new seal ring (O-ring) at attachment flange.

Part no.: 2 410 210 073

- * Clean assembly surface on pump housing.
- * Guide ELAB with new seal ring over stud bolt and press on.
- * Screw on fastening nuts and tighten to 10...12 Nm.
- * Screw on overflow valve and fuel lines with new seal rings.
- * Connect up lead.

ELAB functional test:

- * Start engine.
- * After complete venting detach electrical connection at ELAB solenoid.
- * Engine must shut off.
- * Re-install connecting line.

Warranty:

- * Warranty: The standard warranty periods apply, as does the 8-week storage obligation for the defective ELAB after credit has been issued by KH/VKD 3.
- * Goodwill decision after warranty period following submission of warranty/goodwill claim w i t h ELAB to K5/QSG.
- * Job times:
 - ELAB replacement on vehicle:
0.8 hrs. (8 WU).
 - ELAB replacement with pump removed:
0.4 hrs. (4 WU).

Warranty (continued):

- * Enter fault no. 95 in warranty/goodwill claim.
Entry in C field: "A04", in field 80: "X".
- * Warranty/goodwill claims which do not feature this information cannot be processed.

Delivery address for goods requested with warranty/goodwill claim:

- * In Germany:

Robert Bosch GmbH
FeW/LOG 3-Auspackraum
z. W. an K5/QSG 1
Am Boschwerk
D-70469 Stuttgart

- * In all other countries:

Local Bosch representative for forwarding to K5/QSG1.

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SCANIA COMM. VEH.
WITH EDC
PE..P.. WITH RE 30

Motor vehicle: NKW
and workshop : EP
12.1994
ST 0439 En

Positioner conversion

The Service Telegram "COMM. VEH. WITH EDC, IDLE INSTABILITY" (see microcard NKW-008 N03) provided information on the possible cause (worn electromagnet armature bushing).

Agreement has now been reached with Scania that if electromagnet replacement is necessary on account of bearing wear, then the positioner is always to be converted at the same time to high oil level and electromagnet with special bearing.

- * High oil level: Removal of oil pump (viscous pump) and seals between camshaft chamber and positioner.
- * Special bearing: Installation of electromagnet with "Hi-eX" bearing. (Hi-eX is a trade name of the bearing manufacturer.)

The following injection-pump assemblies are affected by the conversion measures:

0 402 696 801
0 402 698 802
0 402 698 804
0 402 896 004
0 402 896 013

Note: The version 0 402 896 013 is available with positioner 0 421 890 009 and ... 019. Conversion only affects the version positioner ... 009.

... 019 already has the conversion features.

Important:

The following special regulation applies to assemblies about which complaints are received with date of manufacture 06.91 - 08.91 (FD 166 - FD 168):

Irrespective of whether there is an assembly fault, in other words not just in the event of bearing wear, the complete positioner cover is to be replaced and conversion to high oil level carried out. The new positioner cover features the part no. 2 425 656 033 and contains the electromagnet with Hi-eX bearing. The positioner is to be given the part no. 0 421 890 019. Refer to page 7 for warranty stipulation.

Bearing assessment:

The information given in the Service Telegram "COMM. VEH. WITH EDC, IDLE INSTABILITY" (see microcard NKW-008 N03) continues to apply. Particular attention is to be paid to the fact that the complaint "Unstable control behavior" may be caused not only by increased bearing wear, but also by loose crimps, damaged connections, injected-quantity fluctuation or defective nozzles. Appropriate checks are to be made prior to positioner disassembly.

As a supplement to the Service Telegram the criteria for bearing assessment are detailed on the following coordinates.

- * With bearing clearance as of 0.16 mm the adjusting magnet is to be replaced and the conversion measure described here performed.
- * With bearing clearance up to max. 0.12 mm the magnet is OK and cannot be the cause of the complaint. Replacement is not permitted.
- * With bearing clearance between 0.13 and 0.15 mm magnet replacement and positioner conversion may be appropriate and are governed by the following assessment criteria:

Bearing clearance 0.13 to 0.15 mm:

The bronze bearing used to date is coated with a thin layer of tin when new. During operation, small areas of tin become detached at the contact points. This is normal and does not lead to malfunctions.

If, on the other hand, the bronze is visible over the entire width of the bearing and over more than 1/3 of the periphery, magnet replacement and conversion are appropriate, since increased wear cannot be ruled out after lengthy operation.

Adjusting-magnet replacement and conversion of positioner to high oil level:

All disassembly, assembly and test work is based on the repair and test instructions for P-pumps with RE positioner VDT-W 400/019 and the repair instructions for P-pumps VDT-W 410/103. These instructions give a detailed description of the operations outlined in the following.

Adjusting-magnet part nos.:

- * Magnet with bronze bearing (to be removed): 3 427 210 104.
- * New magnet with Hi-eX bearing:
2 427 210 019.

Conversion measures on positioner cover:

- * Scrap magnet with bronze bearing (already removed after measurement).
- * Fit new magnet with Hi-eX bearing. Observe soldering specifications and checking of dimension "X".

Conversion measures on injection pump (conversion to high oil level):

- * Remove speed-sensor pulse wheel.
- * Remove oil pump, spring and hose (parts are no longer needed).
- * Remove intermediate flange (for camshaft bearing).
- * Press out radial-lip-type oil seal of intermediate flange and scrap.
- * Remove O-ring of intermediate flange and scrap.
- * Fit intermediate flange.
- * Fit speed-sensor pulse wheel and adjust.
- * Fit positioner and completely adjust assembly as per instructions.

Marking:

After conversion, the assembly and positioner part nos. are to be altered. Use can still be made of the original rating plates, since a maximum of two digits are affected.

- * The standard positioner designation is 0 421 890 019.
- * Assemblies for which there is no successor version are marked with "A" after the part no.
- * Other assemblies are given the designation of the successor version.
- * The pump type designation remains the same.

Refer to the following overview.

Original assembly with positioner	--> New designation --> with positioner
0 402 696 801	--> 0 402 696 803
0 421 890 009	--> 0 421 890 019
0 402 698 802	--> 0 402 698 802 A
0 421 890 007	--> 0 421 890 019
0 402 896 004	--> 0 402 896 004 A
0 421 890 009	--> 0 421 890 019
0 402 698 804	--> 0 402 698 805
0 421 890 007	--> 0 421 890 019
0 402 896 013	--> 0 402 896 013
0 421 890 009	--> 0 421 890 019

Warranty:

- * The special stipulation given in the 06.93 KH/VKD3 warranty information "Scania comm. veh., EDC positioner/worn adjusting-magnet bearing" continues to apply, as does the 8-week storage obligation for the removed parts after credit has been issued by KH/VKD3.
- * Goodwill decision after warranty period following submission of goodwill claim to K5/QSG.
Storage obligation for parts:
8 weeks.
Complete positioner covers are always to be submitted with warranty claim.

Warranty (continued):

- * Job time for entire conversion measure: 2 hours (20 WU).
- * Enter fault no. 90 in warranty/goodwill claim.
Entry in C field: "A01", in field 80: "X".
- * Warranty/goodwill claims which do not feature this information cannot be processed.

**Delivery address for goods requested
with warranty/goodwill claim:**

*** In Germany:**

**Robert Bosch GmbH
FeW/LOG 3-Auspackraum
z. W. an K5/QSG 1
Am Boschwerk
D-70469 Stuttgart**

*** In all other countries:**

**Local Bosch representative for
forwarding to K5/QSG1.**

Published by:

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Division KH
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country**

IN-LINE PUMPS PE (S) ..

Workshop: EP

12.1994

0443 En

Stay bolts of assembly unions:

Checking/correction of projection

This affects in-line pumps of size:

- PE (S) .. H ..
- PE (S) .. R ..
- PE (S) .. P .. 7100
- PE (S) .. P .. 7800
- PE (S) .. P .. 8000
- PE (S) .. P .. 8500

A stay bolt which has not been fully screwed into the pump housing can jeopardize correct functioning of the assembly union and, in extreme cases, result in fracture of the stay bolt.

For this reason, a stay bolt check must always be performed when repairing the above-mentioned pumps.

A description is given on the following pages of how to check/correct the stay bolt dimension.

Note:

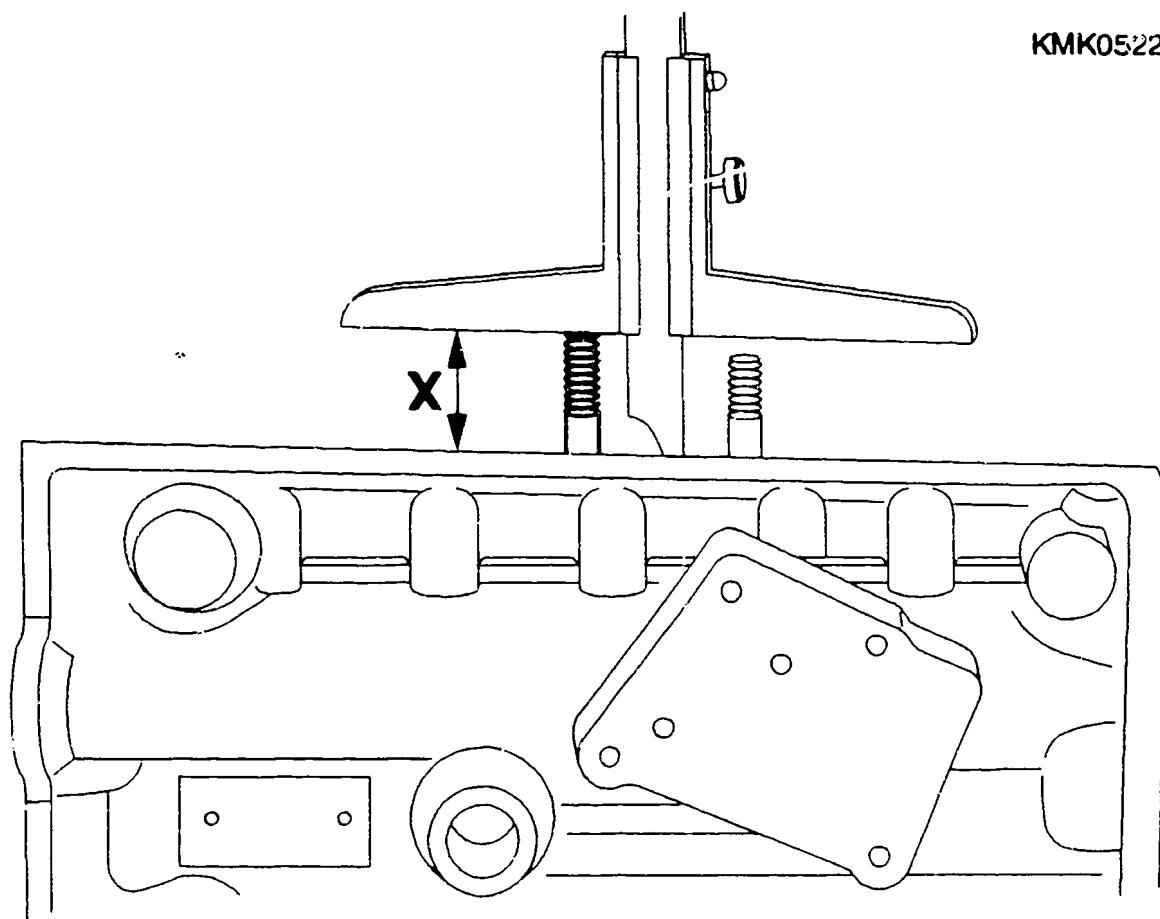
To simplify illustration, only two stay bolts were left in the injection pump. The procedure described in the following is however to be implemented with every stay bolt.

Use depth gauge to determine existing projection (dimension X) and compare to set value.

Set values - projection (dimension X):

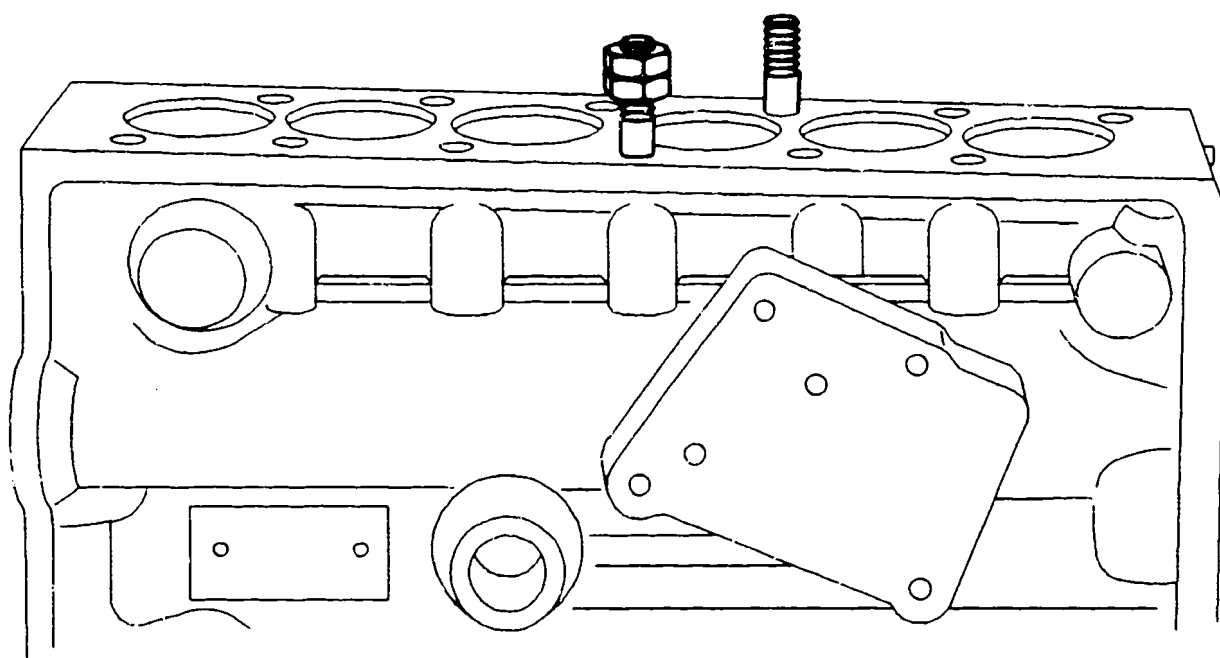
- Short stay bolts: max. 26.80 mm
- Long stay bolts: max. 40.30 mm

KMK05223



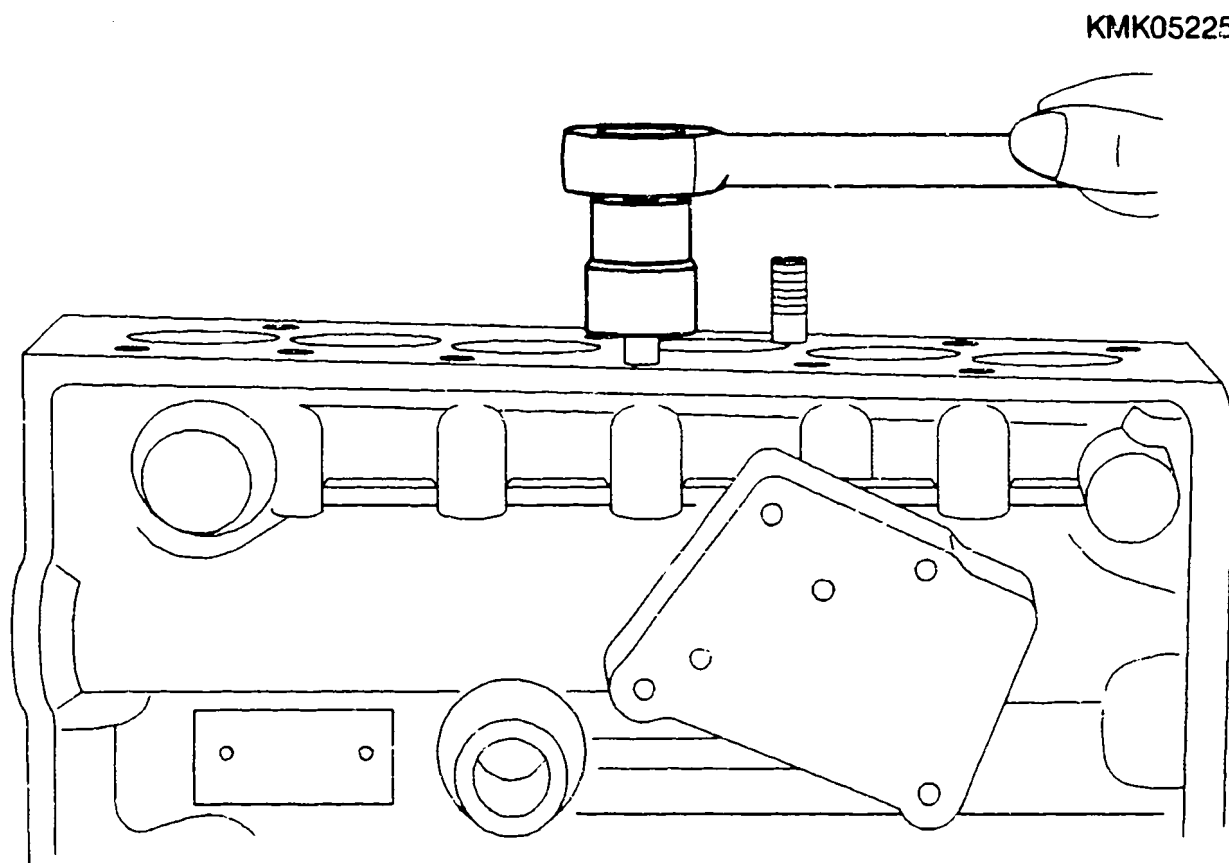
If the dimension determined does not tally with the set value, screw two hexagon nuts onto the stay bolt and mutually lock. Position nuts such that one turn of stay bolt thread is still visible.

KMK05224



Screw in/screw out stay bolt, depending on dimension determined.

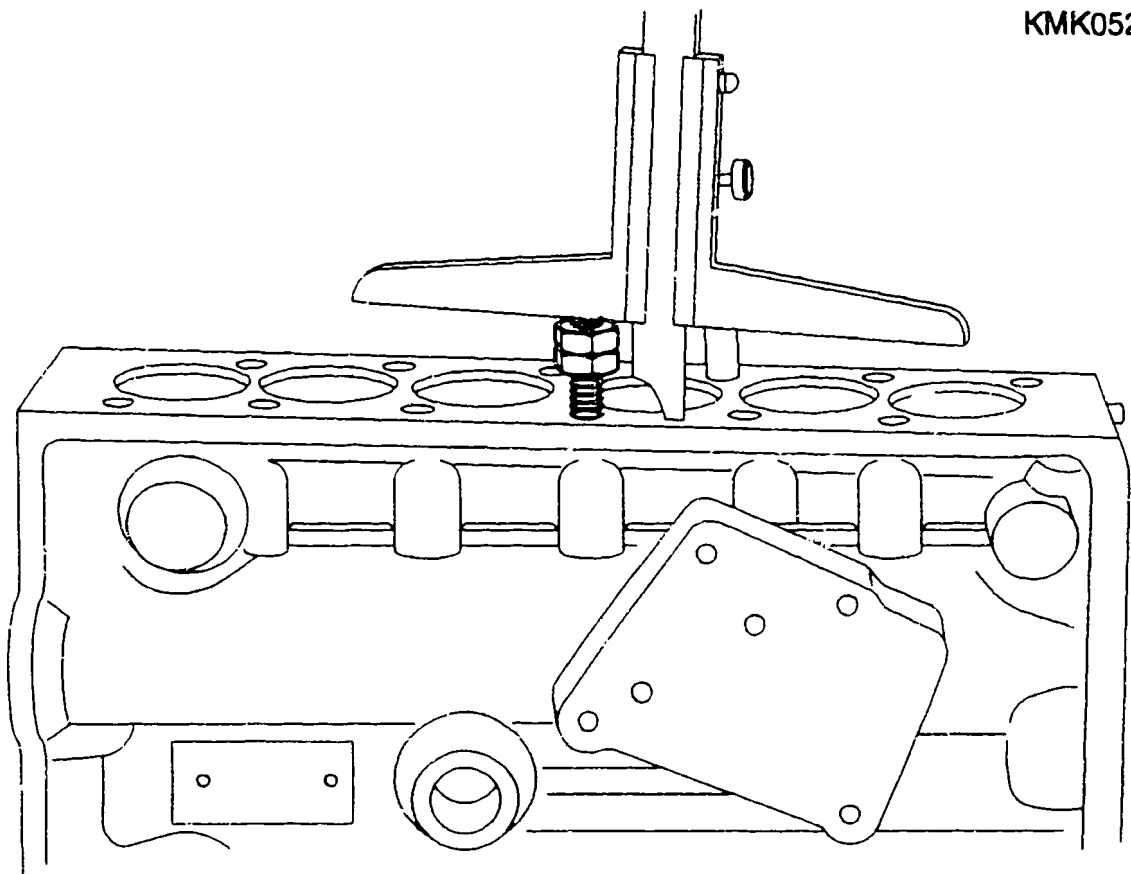
When screwing in, take care NOT to exceed prescribed tightening torque of 25...30 Nm.



If dimension determined coincides with set value, loosen and screw off hexagon nuts.

Set values - projection (dimension X):

- Short stay bolts: max. 26.80 mm
- Long stay bolts: max. 40.30 mm



KMK05226

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Barrel-and-flange elements: Introduction of "hard seal" - no soft seal between delivery valve and pump barrel

In a few instances, there is no gasket between flange cylinder and delivery valve with certain new releases of injection pump of type P-7100.

This modification led to a design change in the components concerned.

The delivery valve (DV) and flange cylinder are thus directly connected, i.e. without soft seal. This method is designated "hard seal".

As a result of the absence of the seal the corresponding components are manufactured to an extremely high tolerance and production level. When performing repairs, particular attention is to be paid to the following items/maximum care is to be exercised:

- * Cleanliness !!
- * Assembly DV/DV holder
- * Wear assessment on sealing surfaces

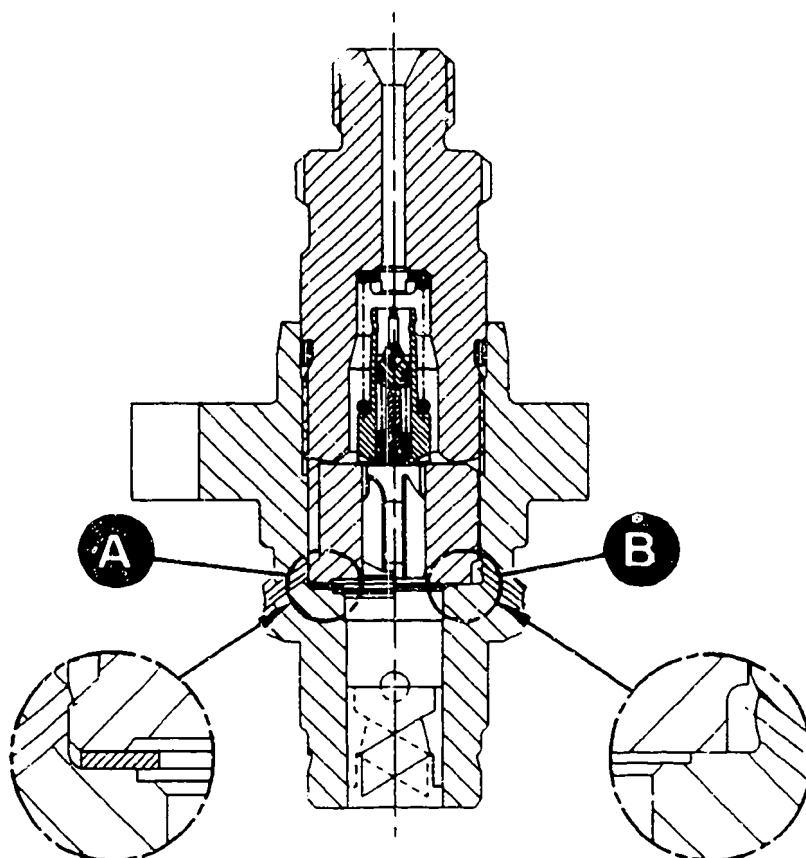
The two delivery-valve soft seals indicated below are currently standard:

1. Gasket
2. Sealing cap

Sectional view, bottom:

Arrow A - DV seal with gasket

Arrow B - "hard seal"

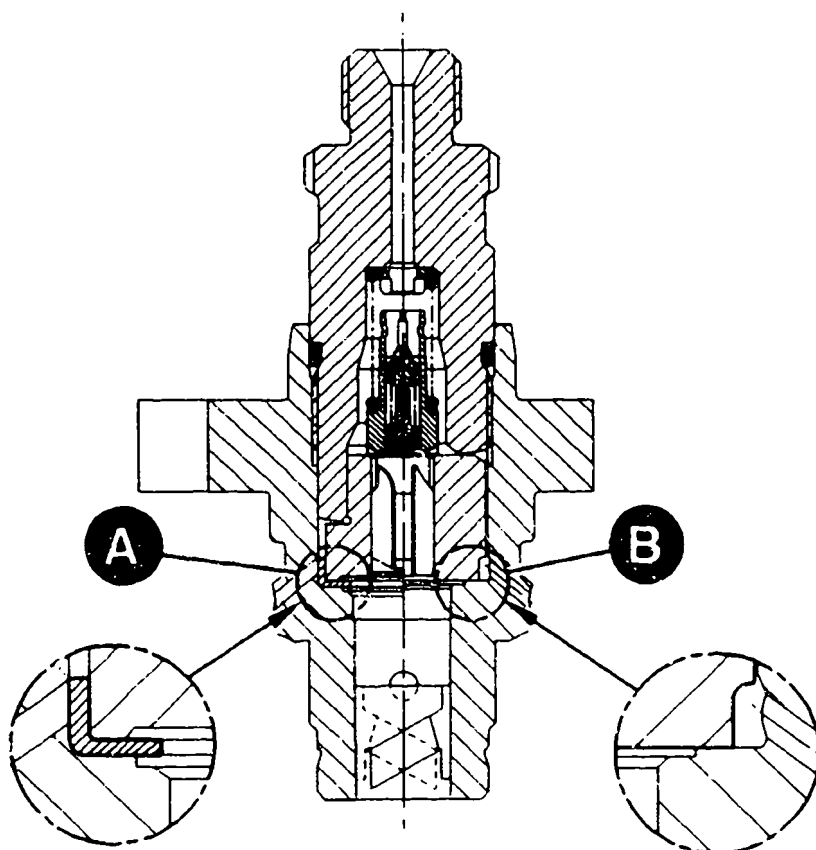


KMK05636

Sectional view, bottom:

Arrow A - DV seal with sealing cap

Arrow B - "hard seal"

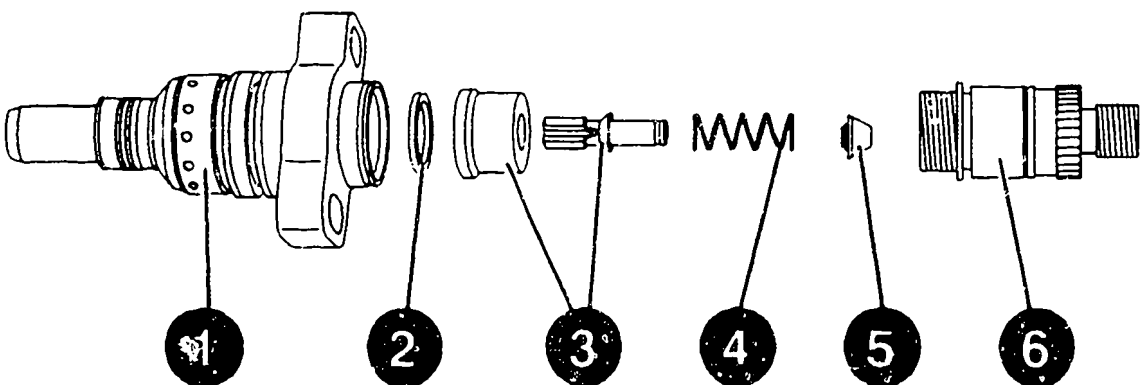


KMK05673

Component drawing, standard version
(with gasket)

- 1 = Flange cylinder
- 2 = Gasket
- 3 = Delivery valve
- 4 = Valve spring
- 5 = Spring seat
- 6 = Delivery-valve holder

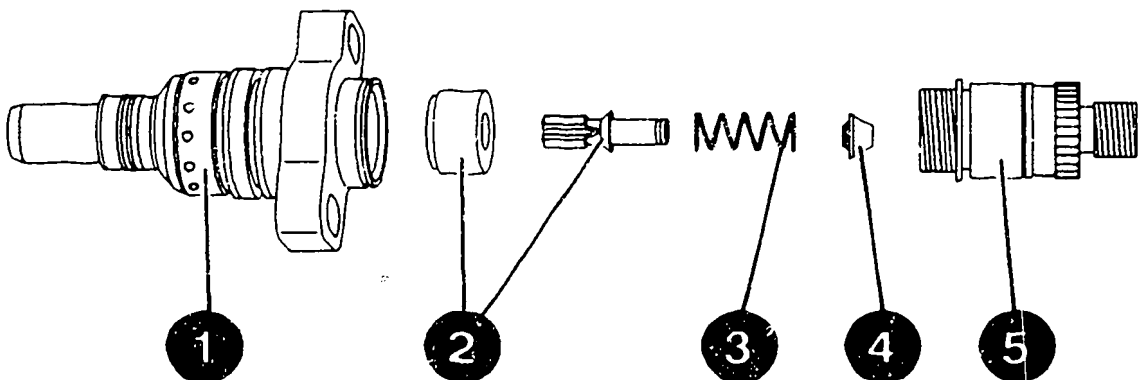
KMK05637



Component drawing, new version "hard seal" (no gasket/sealing cap)

- 1 = Flange cylinder**
- 2 = Delivery valve**
- 3 = Valve spring**
- 4 = Spring seat**
- 5 = Delivery-valve holder**

KMK05638



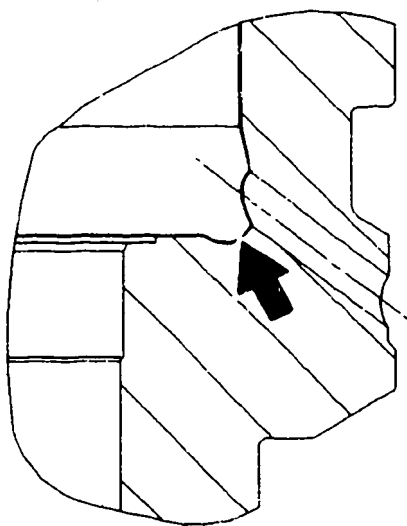
Use is made of the following types of assembly cylinder with the "hard seal":

1. With undercut - fig. a
2. No undercut - fig. b

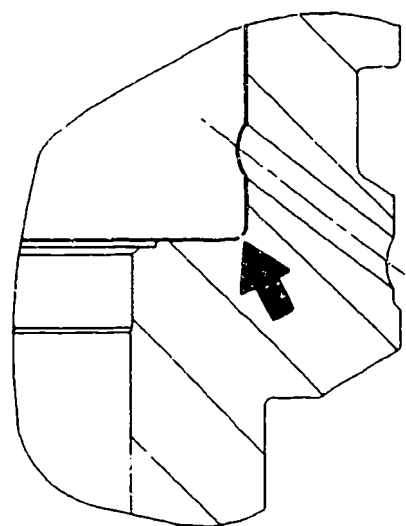
Functionally and hydraulically both versions are identical.

When performing repairs, use is to be made of the appropriate pump service-parts list.

KMK05639



a



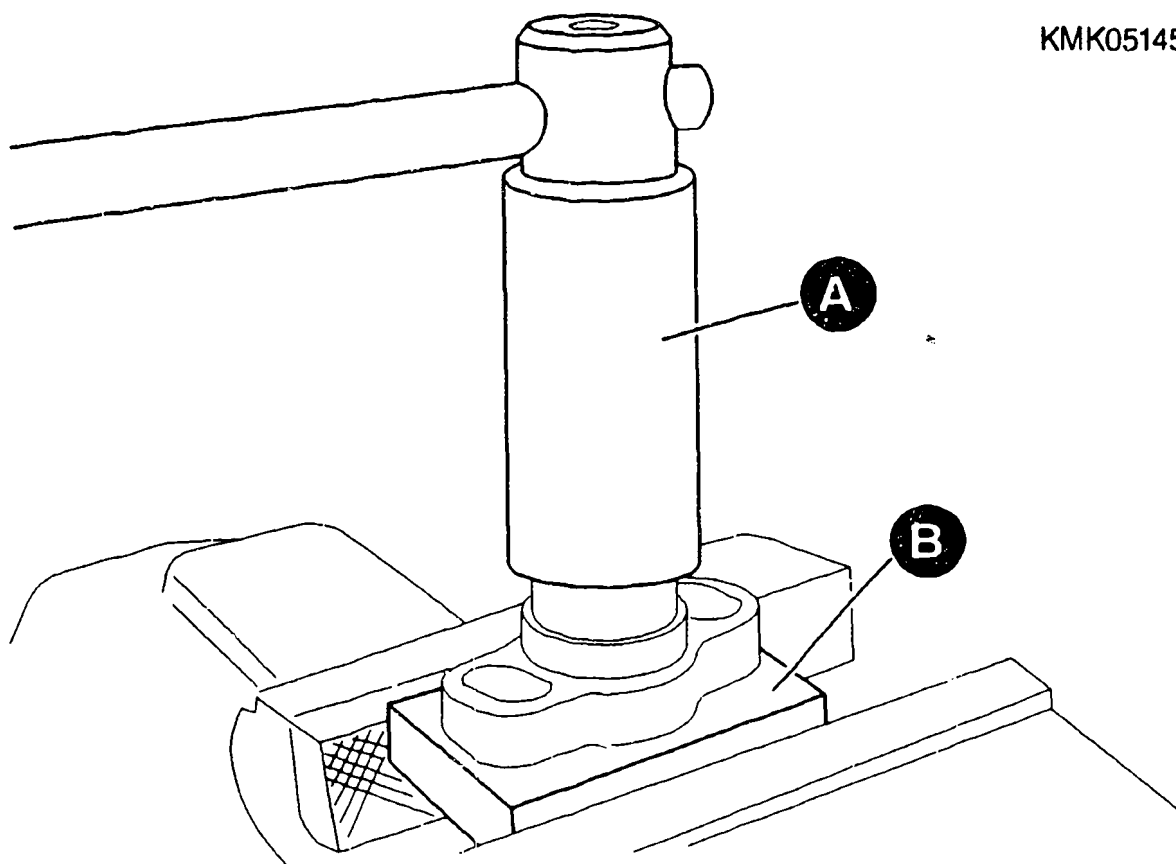
b

DISASSEMBLY OF BARREL-AND-FLANGE ELEMENT

Remove element in line with appropriate pump repair instructions.

Place barrel-and-valve assembly in assembly device (B) 0 986 611 356 (KDEP 2962).

Loosen delivery-valve holder with socket wrench (A) 0 986 611 451 (KDEP 2986) and screw out.



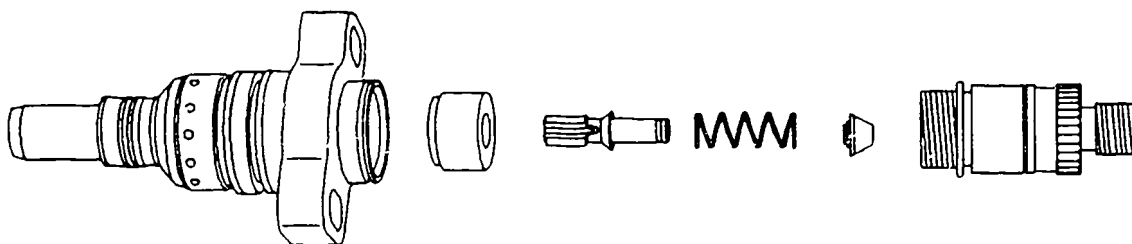
DISASSEMBLY OF BARREL-AND-VALVE ELEMENT

Remove valve spring with spring seat
from delivery-valve holder.

Remove O-ring from delivery-valve
holder.

Remove delivery valve from pump barrel.

KMK05216



COMPONENT CLEANING

Wash out components in commercially available cleaning agent (e.g. chloro-thene NU) which is not readily flammable.

Observe following safety precautions:

In Germany:

Order governing work with combustible liquids (Vbf) published by Federal Ministry of Labor (BmA).

SAFETY MEASURES

Safety regulations for handling chlorinated hydrocarbons

for companies ZH 1 / 222

for employees ZH 1 / 129

as published by Main Association of Insurance Liability Associations (Central Association for Accident Prevention and Industrial Medicine) Langwartweg 103, 53129 Bonn.

In all other countries attention is to be paid to the corresponding local regulations.

**COMPONENT CHECKING
- WEAR ASSESSMENT**

Renew worn or damaged components.

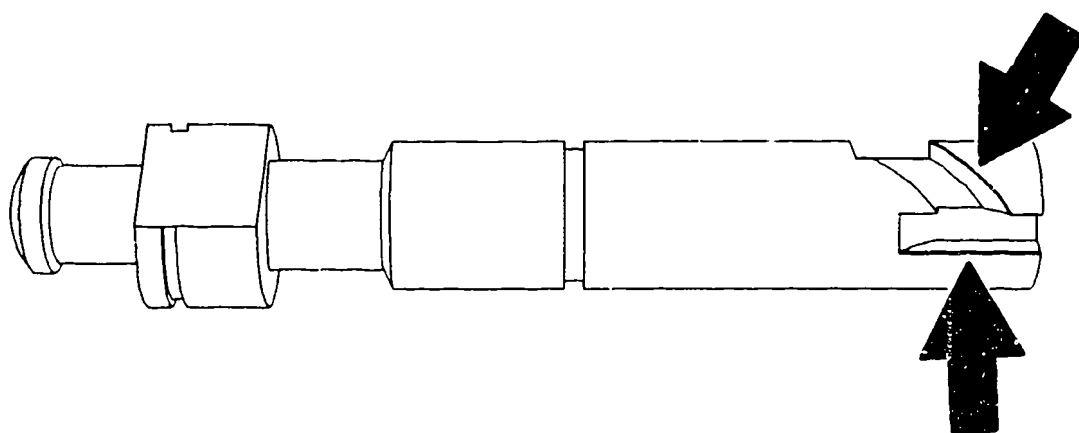
Always renew O-rings and snap rings.

Pay particular attention to helices of pump plungers.

The helices must be sharp edged and not rounded (arrows).

The bearing surfaces must not exhibit tracking or scoring.

KMK01253



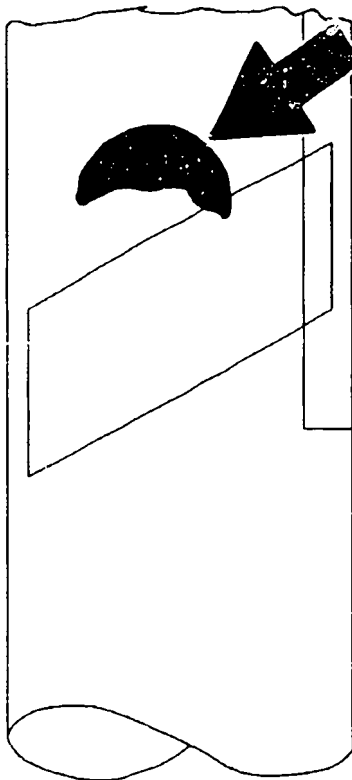
COMPONENT CHECKING - WEAR ASSESSMENT

Pay attention to the following so as to avoid uncertainty regarding assessment of plunger-and-barrel assemblies:

Assembly renewal is justified in the case of:

- * Cavitation in the area of the helices (arrow).
- * Assembly seizure or sticking due to dirt or surface coatings; can be ascertained by way of slide test (plunger in barrel).

KMK01254



**COMPONENT CHECKING
- WEAR ASSESSMENT**

Note:

Prior to test, wash out pump plunger and barrel in calibrating oil.

Hold pump plunger and barrel more or less vertical.

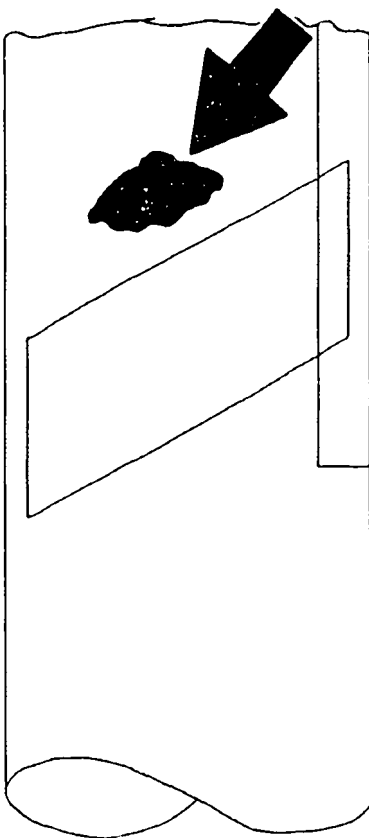
Weight of pump plunger must cause it to slide down barrel.

COMPONENT CHECKING - WEAR ASSESSMENT

Assembly renewal is not justified in the case of:

- * Cavitation above the helices (arrow).
- * Matt areas on the entire periphery.
- * Bright areas (without scoring and mechanical wear).
- * Discoloration at plunger and flange cylinder as a result of fuel and lubricant residues, water in fuel or influence of temperature.

KMK01255



**COMPONENT CHECKING
- WEAR ASSESSMENT**

Note:

Damage to sealing surfaces of pump barrel and delivery valve is not permitted (as is the case with all flange cylinder pumps).

Attention must be paid to the appropriate assessment notes on the following pages concerning sealing surface of flange cylinder.

Assemblies and delivery valves can be replaced separately in the case of repairs.

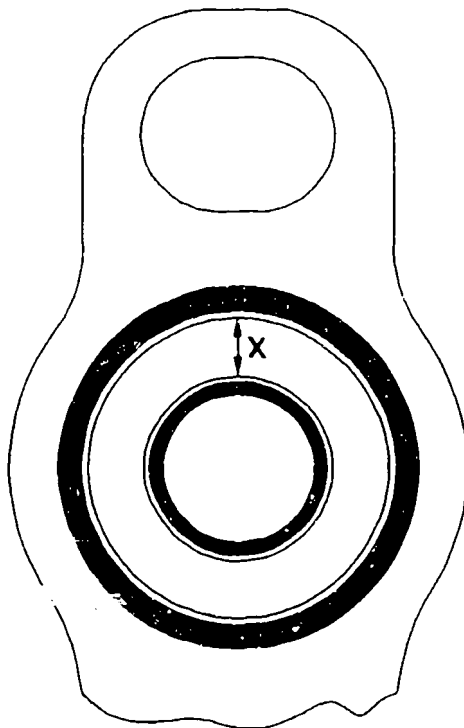
**COMPONENT CHECKING
- WEAR ASSESSMENT**

Fig.:

**Top view of flange cylinder DV sealing
surface of new plunger-and-barrel
assembly.**

X = Radial sealing length

KMK05674



**COMPONENT CHECKING
- WEAR ASSESSMENT**

Fig.:

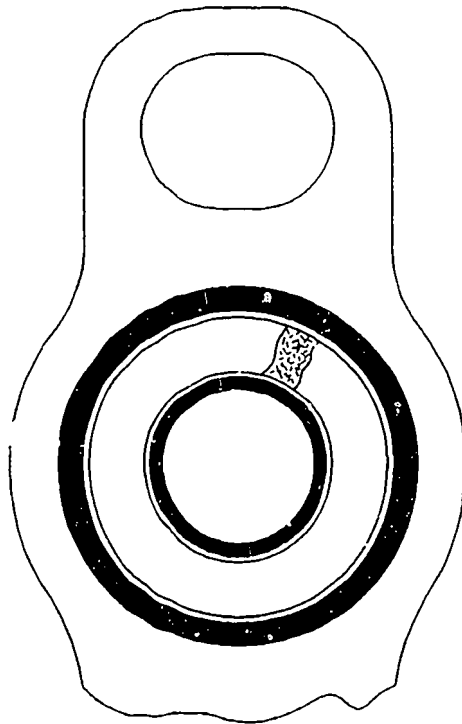
**Cavitation at a minimum of one location
over the entire radial sealing length.**

**Replacement of barrel-and-flange
element is justified.**

Note:

**If a damaged barrel-and-flange
element is replaced with a new one
on account of the fault described
above, use must also be made of a new
delivery valve.**

KMK05675



**COMPONENT CHECKING
- WEAR ASSESSMENT**

Fig.:

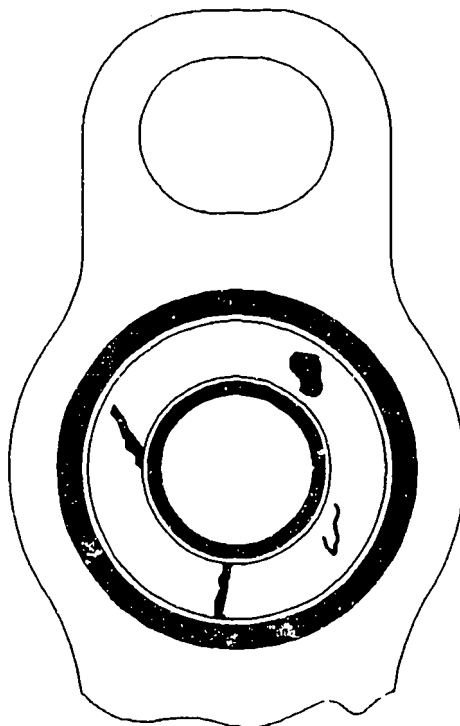
**Foreign matter (e.g. dirt, chips)
impressed in sealing surface.**

**Replacement of barrel-and-flange
element is justified.**

Note:

**If a damaged barrel-and-flange
element is replaced with a new one
on account of the fault described
above, use must be made of a new
delivery valve.**

KMK05676



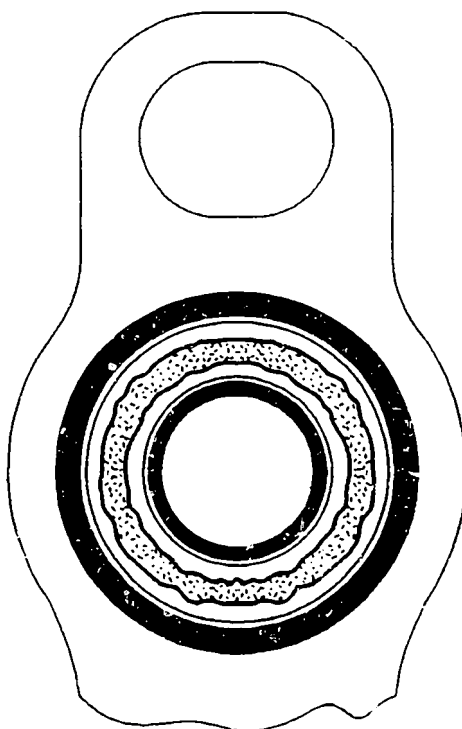
**COMPONENT CHECKING
- WEAR ASSESSMENT**

Fig.:

**Normal sealing-surface shadow effect
caused by torsion and micro-movement
(no cavitation of entire radial
sealing length)**

**Replacement of barrel-and-flange
element is N O T justified.**

KMK05677

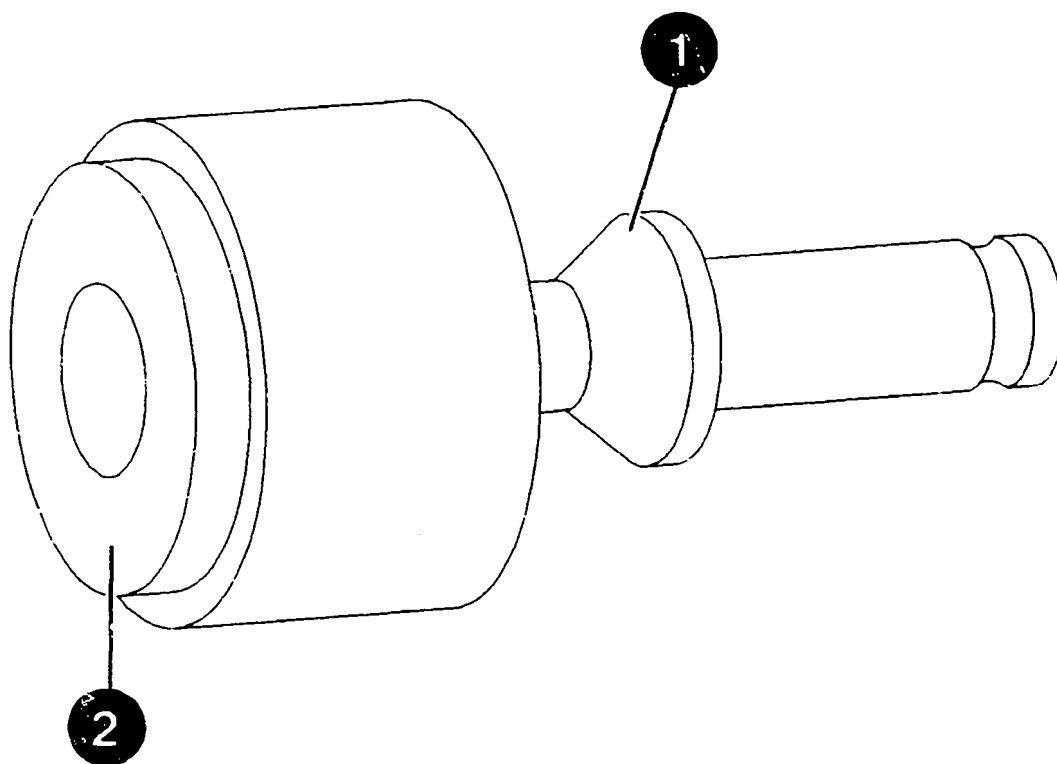


COMPONENT CHECKING
- WEAR ASSESSMENT

Seat of valve cone (1) and sealing surface of valve body (2) must not be dented, exhibit cavitation or show signs of uneven wear.

If valve sticks in valve holder, delivery valve is to be renewed.

KMK05217



ASSEMBLING BARREL-AND-VALVE ASSEMBLY

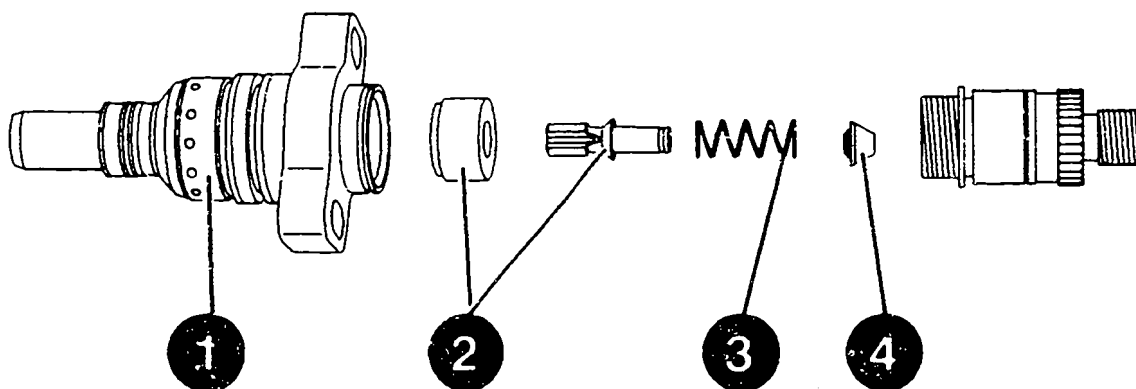
Place pump barrel (1) in assembly device 0 986 611 356 (KDEP 2962). Insert delivery valve (2) and valve spring (3) with spring seat (4) in pump barrel.

Attention:

* Use is not to be made of lubricant on underside and support surface of delivery valve when installing in pump barrel; wetting with fuel or calibrating oil is permitted.

ENSURE CLEANLINESS.

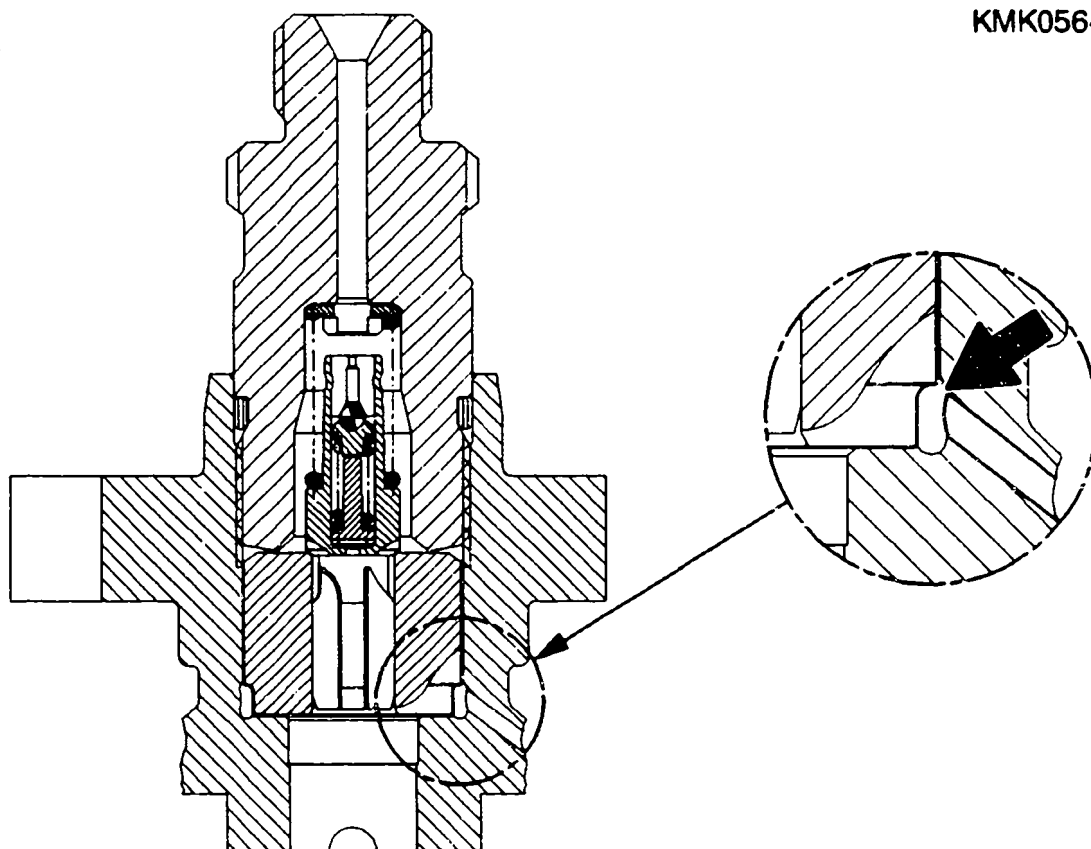
KMK05218



ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Note:

When assembling delivery valve make sure that shoulder on valve holder is facing downwards in direction of plunger-and-barrel assembly (fig. - circle).



Valve cone and valve holder have a defined sealing seat, the sealing surfaces of which are specially machined. If the valve cone is inadvertently inserted into the opposite side of the valve-holder bore (shoulder then faces upwards), leakage will subsequently result and become apparent in the form of:

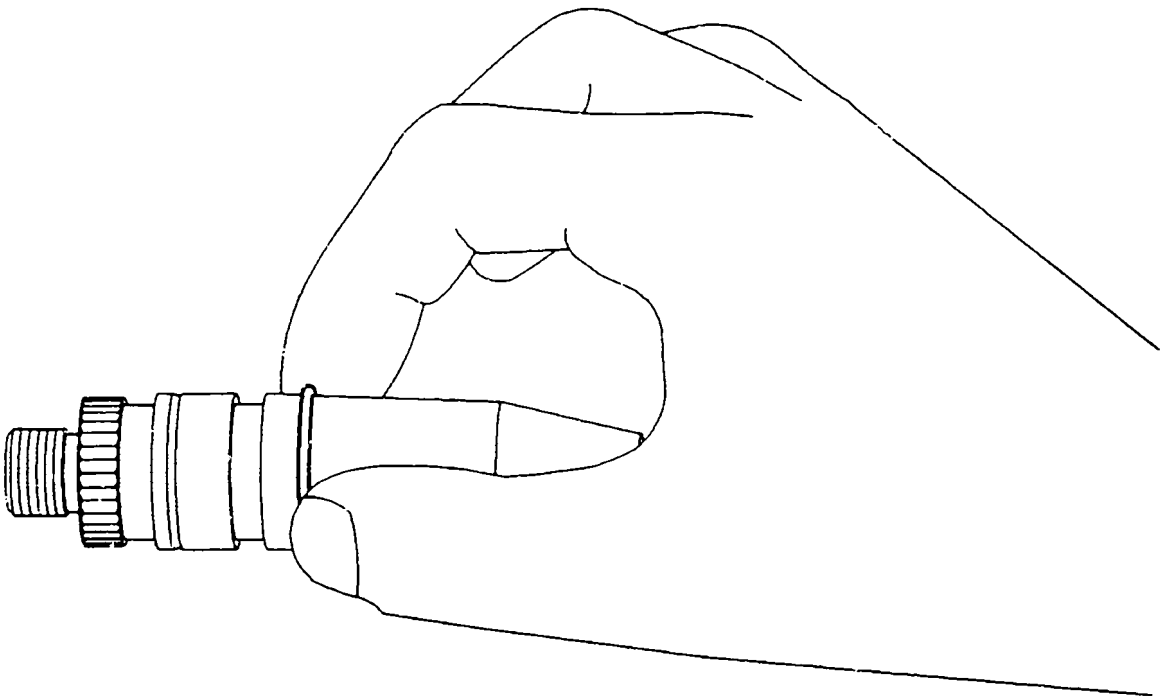
- * Incorrect delivery line pressure
- * Injected quantity may be impossible to adjust
- * Major fluctuations in injected quantity
-> "Hunting at idle"

ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Slip O-ring over assembly sleeve
0 986 612 606 and press sleeve onto
delivery-valve holder as far as start
of recess.

The O-ring can thus be slipped
undamaged onto delivery-valve holder.

KMK05219



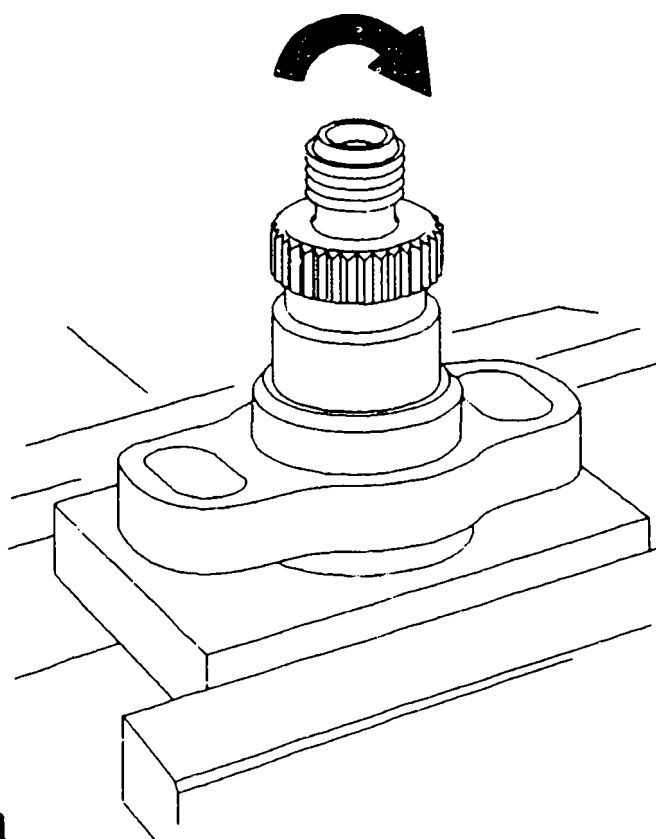
ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Apply lubricant 5 963 340 105 or transmission oil to thread as far as O-ring level and screw in delivery-valve holder by hand. Use socket wrench 0 986 611 356 (KDEP 2962) to pretighten delivery-valve holder to torque of approx. 50 Nm.

Then perform final tightening of delivery-valve holder to 110...120 Nm in one operation (fig. a).

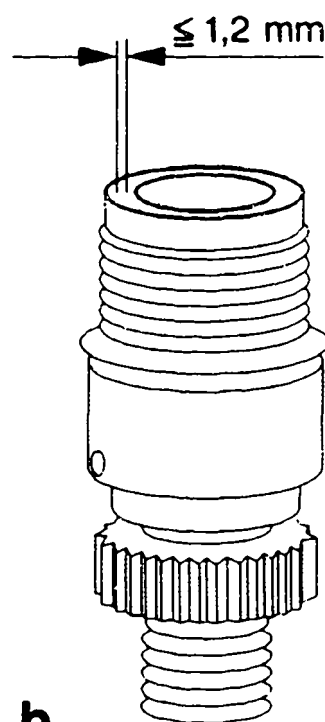
Note:

Flattened gripping edge of used delivery-valve holders must be ≤ 1.2 mm (fig. b).



a

KMK05641



b

Re-install barrel-and-flange element
in line with corresponding pump repair
instructions.

IMPORTANT:

Sealing surface between assembly
cylinder and delivery valve must never
be reworked (e.g. lapped).

Subsequent installation of soft seal
is not permitted.

Pay attention to general cleanliness.

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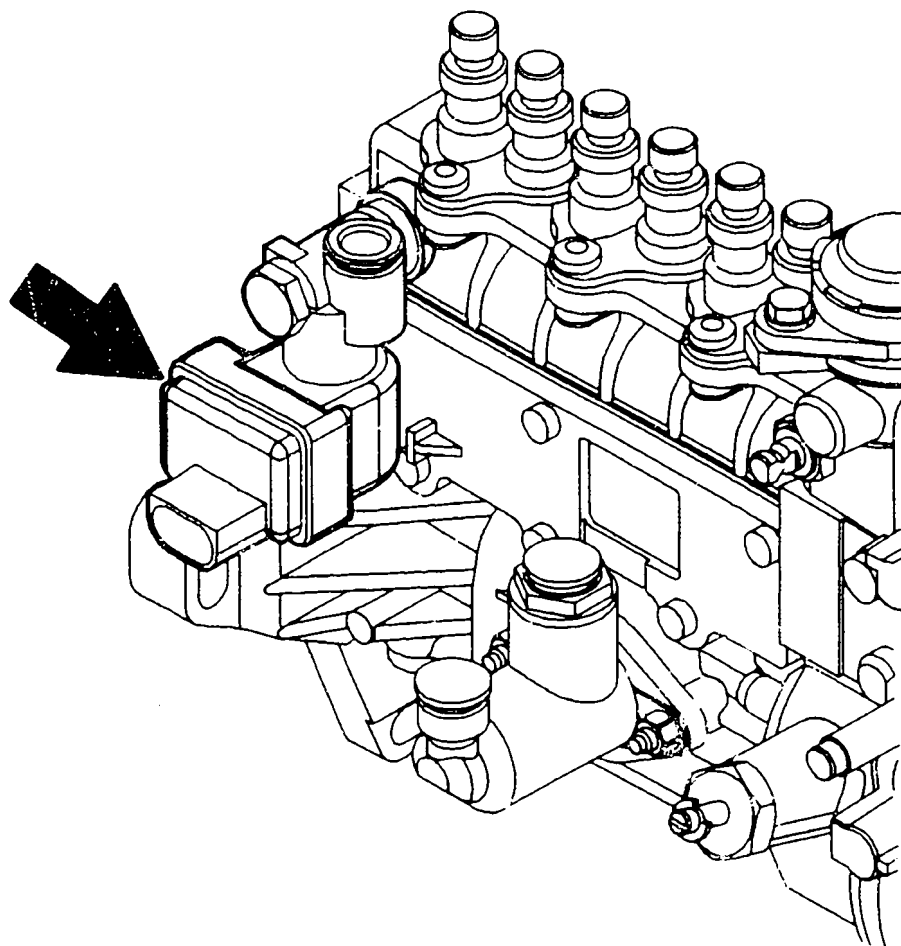
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**IN-LINE PUMP
SIZE M**

**Workshop: EP
12.1994
SI 0447 En**

Encodable solenoid valve as anti-theft device on mechanically governed M pumps, Mercedes Benz

As of 1.1.1995 motor-vehicle insurance companies will be requiring a factory fitted immobilizer for new vehicles. Part of this anti-theft package is an encodable solenoid valve integrated into the fuel inlet to the injection pump.



KMK05678

The function of the solenoid valve can only be tested in the vehicle.

To facilitate repair and testing of the injection pump for RB Service, MB Service will be removing the solenoid valve prior to delivery of the pump.

If, however, injection pumps are received where the solenoid valve is attached, it is to be removed prior to repair and testing.

The injection pump can then be repaired and tested in the usual way.

For solenoid valve installation use is n o t to be made of standard inlet-union screws, b u t of screws with the following part nos.:

- * A 601 990 06 63 (inlet-union screw)
- * A 601 990 07 63 (break-off screw)
- * N 007 603 012 110 (seal, 2x)

The listed parts must be obtained from Mercedes-Benz Service.

The following pump/governor assemblies may feature solenoid valve:

- * 0 400 074 890
- * 0 400 074 884 (1)
- * 0 400 074 883 (1)
- * 0 400 076 956 (1)
- * 0 400 076 960

(1) Fastening screw = break-off screw

If solenoid valve is attached to pump with break-off screw, disassembly/assembly involves an additional outlay of 5 WU.

I m p o r t a n t :

An encoded solenoid valve is always paired with a vehicle immobilizer. This means that after repairing and/or testing the injection pump o n l y the original solenoid valve may be re-installed on the pump concerned. Interchange or renewal of the solenoid a l w a y s requires adaption to the immobilizer in the vehicle at a Mercedes-Benz service station. It is not possible at present to use the KTS 300 for this purpose.

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IN-LINE PUMPS PE (S) ..

Workshop: EP

12.1994

ST 0452 En

Checking and adjustment of in-line
pumps with engine overflow valve

To date, test-bench checking and
adjustment of in-line pumps of sizes
P and R has been by way of defined
test overflow valves.

On installing the pump assembly in the
engine, the test overflow valve is then
replaced by the engine overflow valve.

Test and engine overflow valve are of
differing design.

This can result in delivery fluctuation
at the engine and thus to differences
in performance.

Newly applied IP assemblies of sizes
P, R and H are thus now only adjusted
using the corresponding engine overflow
valve with which they are subsequently
delivered.

As a result, there is no possibility
of a change in the amount of fuel
injected.

Please inform your customers that IP assemblies are always to be supplied in future w i t h engine overflow valve.

The IP assembly is checked in line with the overflow valve given in the test specification sheet.

If the test specification sheet still lists one of the familiar test overflow valves, the engine overflow valve is n o t to be used and vice versa.

If an IP assembly with engine overflow valve is to be checked, and should this be delivered without the overflow valve, employ the following procedure:

- * Check IP assembly with a new engine overflow valve featuring the same part number
- * Remove engine overflow valve from pump after checking

This procedure is only to be applied in exceptional circumstances.

The following is a list of the engine overflow valves most frequently used at present:

Mercedes Benz :	1 417 413 047
	2 417 413 082
RVI :	2 417 413 071
	2 417 413 084
Volvo :	2 417 413 078
MAN :	2 417 413 082

The listed overflow valves may also be encountered with IP assemblies from other engine manufacturers.

Engine overflow valves which are only used infrequently are not listed.

In future, engine overflow valves are likewise to be found by way of the pump replacement parts list.

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PES..M../RE 22

0 400 19. ...

Mercedes Benz C 250 Diesel

Workshop: EP

12.1994

SI 0453 En

Worn armature bushing in EDC
positioner RE 22

The fault symptoms listed below may
occasionally be encountered on the
vehicles listed with more than
100 000 km on the clock:

FAULT DESCRIPTION:

- * EDC lamp lights.
- * EDC system switches to limp-home
mode, reduced engine power.
- * Engine may cut out.

POSSIBLE CAUSE:

The cause may be stiffness of the EDC RE positioner which the EDC system recognises as "permanent deviation" of the injected-quantity adjuster and thus switches to limp-home mode.

Such stiffness is also recognised by the self-diagnosis system and output as "permanent deviation" fault.

Stiffness may be caused by an excessively worn large armature bush in the RE positioner magnet.

FAULT ELIMINATION:

If "permanent deviation" fault is detected, remove injection pump, measure armature bearing clearance and, if necessary, replace complete magnet.

Important:

Agreement has been reached with Mercedes Benz that whenever bearing wear results in magnet replacement, exclusive use is to be made of magnets with special bearing ("Hi-eX" bearing. Hi-eX is a trademark of the bearing manufacturer).

Disassembly/assembly of the positioner, removal/installation of the magnet and precise measurement of the armature bearing clearance are to be performed in accordance with the detailed descriptions given in the test and repair instructions for M-pump/RE 22 (see VDT-W-400/0..).

Positioner affected: 0 420 090 002.

Magnet part nos.:

- * Old magnet with bronze bearing:
1 427 210 007. No longer permitted.
- * New magnet with Hi-eX bearing:
1 427 210 009. Immediately available.

Pay attention to the following bearing assessment criteria when measuring bearing clearance:

- * Always replace magnet in the case of bearing clearance as of 0.16 mm.
- * With bearing clearance up to max. 0.12 mm, magnet is OK and cannot be the cause of the complaint. Replacement is not permitted.
- * Magnet replacement may be appropriate with bearing clearance between 0.13 and 0.15 mm and depends on the assessment criteria described on the following Coordinate:

Bearing clearance 0.13 to 0.15 mm:

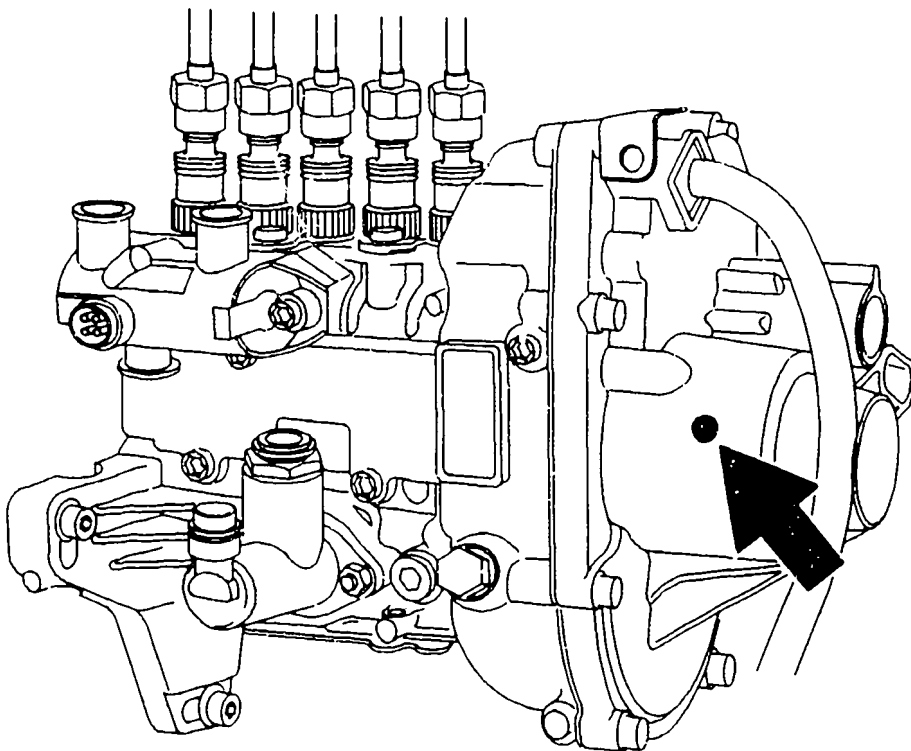
The old bronze bearing is coated as new with a thin layer of tin. In the course of operation the tin flakes off slightly at the contact points. This is normal and does not cause malfunction.

If, on the other hand, bronze can be seen over the entire bearing width and more than 1/3 of the periphery, magnet replacement is appropriate since wear may increase after a lengthy period of operation.

MARKING:

If the magnet is replaced, installation of the new magnet with Hi-eX bearing is to be indicated by marking the outside of the positioner as follows:

Apply blob of blue paint (min. 6 mm) to positioner as shown (arrow).



KMK05683

WARRANTY

General warranty conditions apply with no special regulations.

Magnets removed which are still under warranty are to be sent to:

*** In Germany:**

**Robert Bosch GmbH
FeW/LOG 3-Auspackraum
z. W. an K5/QSG 1
Am Boschwerk
70469 Stuttgart**

*** In all other countries to local representative for forwarding to the above address.**

Published by:

**Robert Bosch GmbH
Division KH
After-Sales-Service Department for
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NEW EDC SYSTEM
EDC 53.1 (MS 5)

Motor vehicle: NKW
and workshop : EP
12.1994
0449 En

for comm. veh.
with in-line pump
PE(S)..H..
(control lever pump)

Reducing the pollutant content of exhaust fumes from commercial-vehicle diesel engines is gaining in importance.

Electronically controlled diesel fuel-injection systems are an important prerequisite as regards compliance with the stringent requirements. By way of electrical measurement, flexible electronic data processing and control loops with electric actuators, electronic control permits a far greater level of parameter processing than is the case with mechanical governors.

Electronic diesel control also permits an exchange of data with other electronic systems (e.g. electronic traction control, electronic transmission control) and thus integration into the overall vehicle system.

The basic EDC system is that introduced into series production in 1989 with the designation EDC 52.2 (control unit M 7).

The main component of this system is the familiar high-pressure injection pump of type "P" with flange-mounted RE positioner for injected-quantity control. The system is described in the service info: "Comm. veh., electronically controlled diesel injection" (see microcard NKW-0..). A further development with a considerably enlarged scope of functions is the system EDC 53.1 (control unit MS 5).

In addition to injected-quantity control, the prime feature of this system is the additional continuous start-of-injection control function.

The following description refers to the EDC - MS 5 basic system.

No allowance is made for vehicle-specific special features in the functional scope.

**Components of the EDC system MS 5
(EDC 53.1):**

- * Injection pump (control-lever pump
RP 39/RP43)
Pump for injected-quantity and
start-of-injection control.
- * Positioner RE 33, RE 36
with injected-quantity and start-of-
injection adjuster
- * Electronic control unit MS 5

- * Fuel supply pump
Mechanical plunger pump, driven
by camshaft of injection pump,
familiar from systems with mechanical
governor.
- * Pedal-position sensor
Rotary potentiometer, linked to
accelerator pedal.
- * Fuel temperature sensor
- * Coolant temperature sensor
- * Air temperature sensor
- * Boost pressure sensor

- * Primary engine-speed sensor
Speed detection at flywheel
- * Auxiliary engine-speed sensor
Speed detection at flywheel
- * Nozzle-holder assembly
Number in line with engine cylinders;
one assembly with needle-motion
sensor
- * Nozzles
In conjunction with nozzle-holder
assembly
- * Vehicle-speed sensor
Speedometer signal

- * Function switches
Various function switches such as
operating element for cruise control.
Brake switches (2 switches), engine-
brake switch, clutch switch, multi-
stage switch, idle switch (integrated
into pedal-position sensor).
- * Plug and cable sets

Injection-pump assembly

As with standard diesel systems featuring mechanical governors, the injection-pump assembly with the EDC system consists of the injection pump itself and a flange-mounted positioner.

The supply for the fuel low-pressure system also takes the familiar form, i.e. a mechanical supply pump driven by the camshaft of the injection pump.

Implementation of the MS 5 (start-of-injection control function) led to the development of the new injection-pump design PE(S)..H., generally referred to as

control-lever pump.

There are two control-lever pump sizes with the following designations:

- * RP 43, stroke = 14 mm,
positioner designation RE 36
- * RP 39, stroke = 18 mm,
positioner designation RE 33

The design and basic function of the control-lever pump essentially correspond to a heavy-duty version of the proven high-pressure pump of size P.

The main difference from the P-pump is the plunger-and-barrel assembly.

The assembly cylinder features a window and a control lever which slides on the assembly plunger. The control lever accommodates the control ports for start and end of delivery.

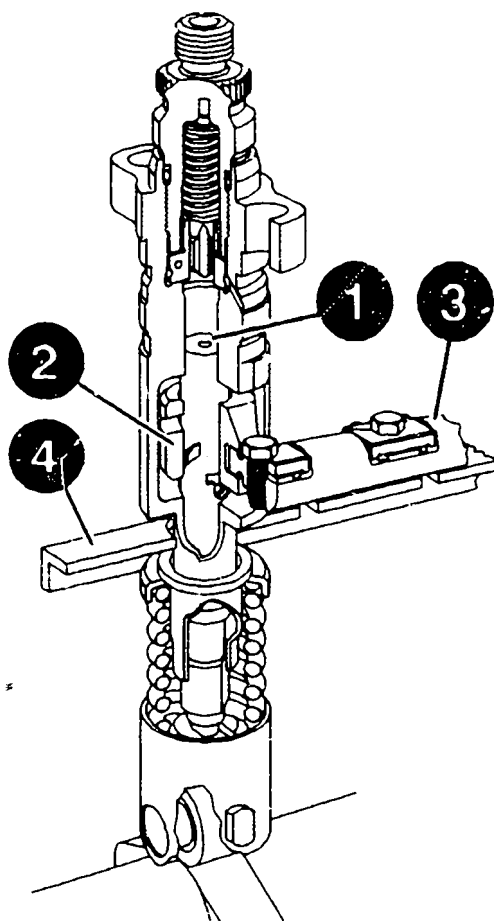
Start and end of delivery can be varied as the control lever is height-adjustable.

The pump housing contains a rotatable adjustment shaft with drive hubs, each of which engages in a groove in the control lever.

Rotation of the shaft uniformly adjusts the height of all control levers and thus changes both prestroke and start of delivery.

Control-lever adjustment mechanism

- 1 = Pump plunger
- 2 = Control lever
- 3 = Control-lever adjustment shaft
- 4 = Control rod



KMK05679

Control of the quantity injected takes the same form as with a P-pump.

The electronic positioner, which accommodates the two main assemblies, namely injected-quantity adjuster and prestroke/start-of-delivery adjuster, is flanged to the injection pump.

The injected-quantity adjuster operates in the same manner as with the familiar EDC RE positioners in conjunction with the P-pump.

The most important component of the injected-quantity adjuster is a linear magnet, the armature of which acts directly on the injected-quantity control rod and thus determines the quantity injected by way of the CRT.

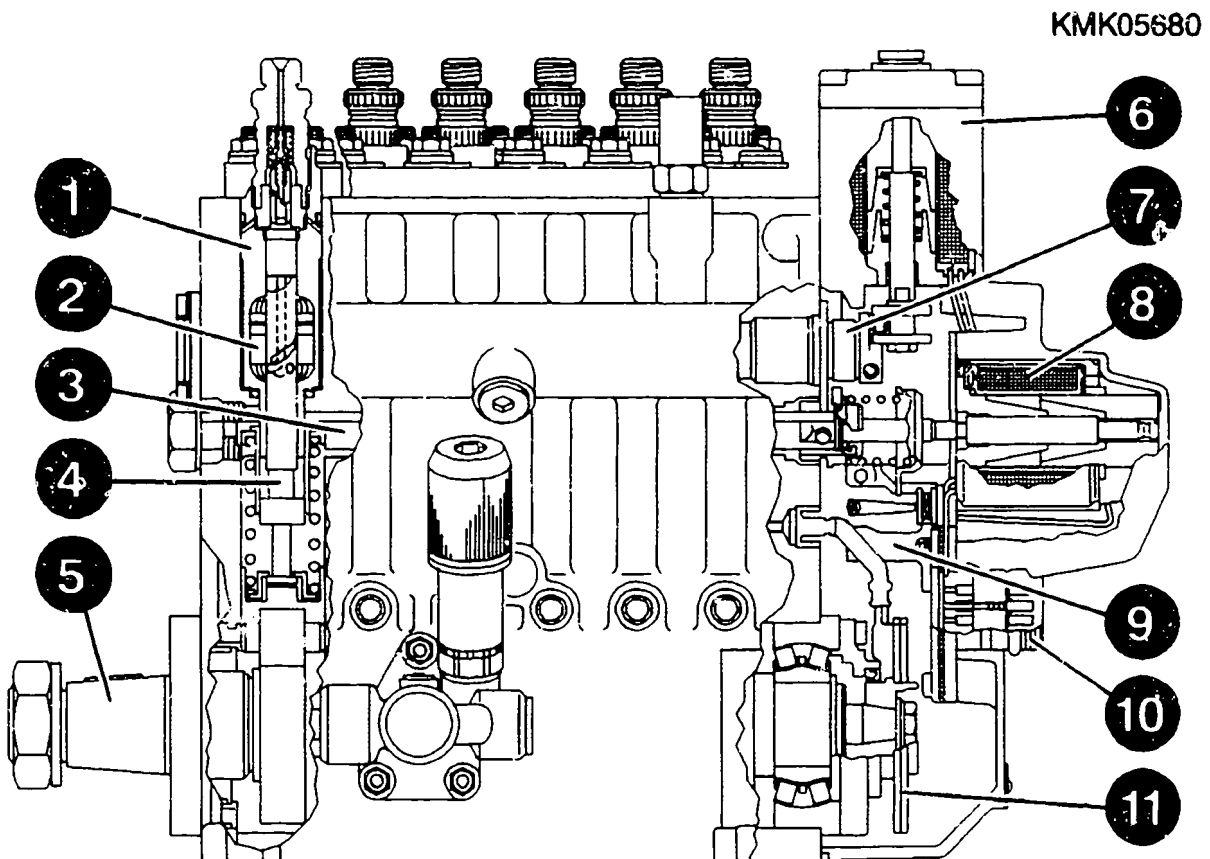
When deenergized, the control rod is held in shutoff position by a spring.

The prestroke/start-of-delivery adjuster also features a linear magnet, the armature of which causes the control-lever adjustment shaft to rotate by way of a control lever.

When deenergized, the adjustment shaft is likewise set via a spring such that the control levers are in their upper position, i.e. in start-of-delivery retard position.

**Control-lever in-line pump
(view showing partial section)**

- 1 = Pump barrel
- 2 = Control lever
- 3 = Control rod
- 4 = Pump plunger
- 5 = Camshaft
- 6 = Start-of-delivery adjusting magnet
- 7 = Control-lever adjustment shaft
- 8 = CRT adjusting magnet
- 9 = Inductive RPS
- 10 = Plug connection
- 11 = Plate for blocking start of delivery and part of oil-return pump



Further components in the RE positioner are an RPS (refer to system description for explanation of function), a contact connection plate with solder pins for the electrical connections of all components and (not always) an oil pump (viscous pump) for returning any oil which ingresses into the positioner to the camshaft chamber.

Overall system:

The linear magnets for controlling injected quantity and start of injection are actuated by an electronic control unit featuring microprocessor technology. The program memory of this control unit contains the maps established for all engine operating conditions.

The following basic distinctions exist between EDC system and mechanical control:

With a mechanical governor, all assemblies affecting the governor characteristics (flyweight assembly, spring sets and correction features such as torque control, stops etc.) are part of the governor.

Changing the governor characteristics involves replacing these components with ones of modified design.

With the EDC system the positioner is always the same irrespective of the map.

Maps, corrections etc. are determined solely by the electronic control unit and are part of the software (data set).

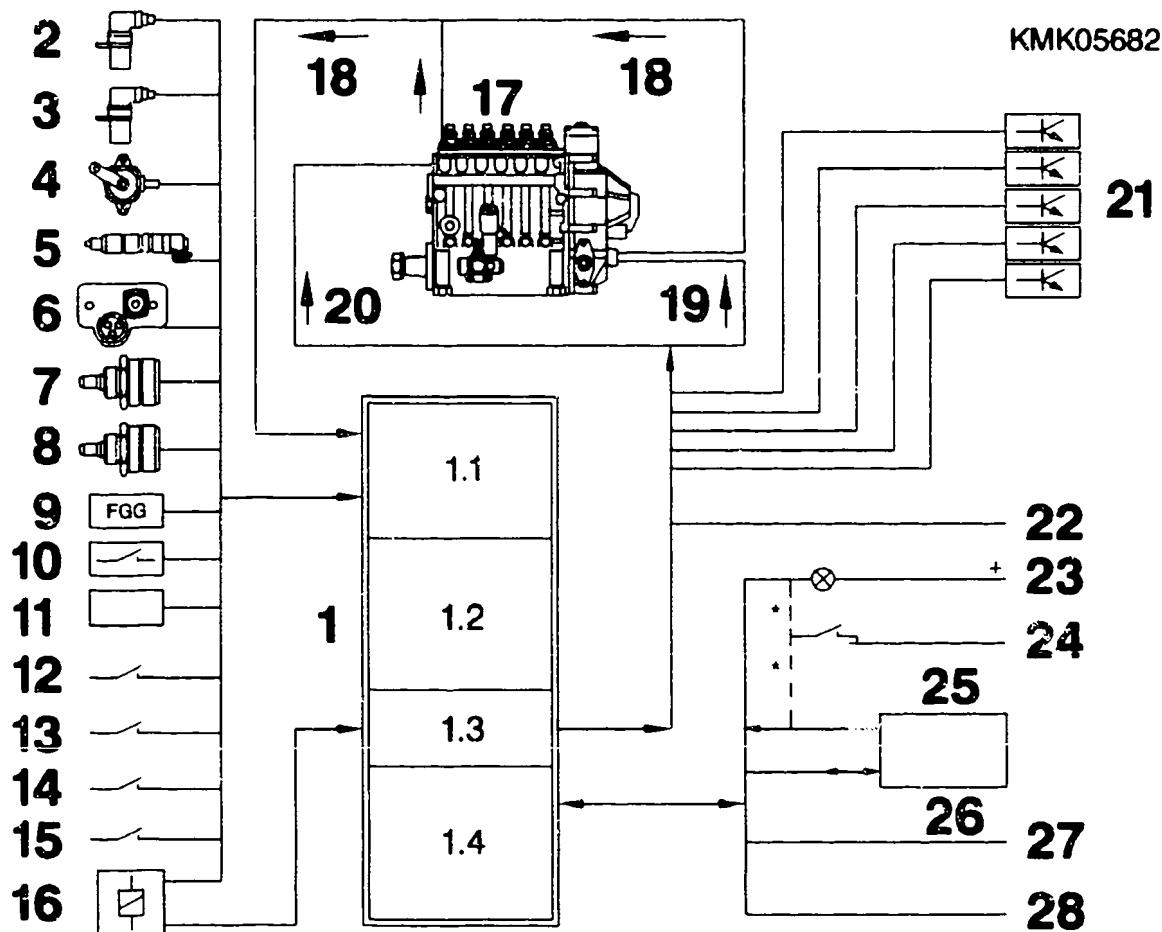
The EDC system has no mechanical linkage connecting accelerator pedal and governor.

The accelerator pedal is linked by way of a pushrod to a pedal-position sensor, which contains a rotary potentiometer.

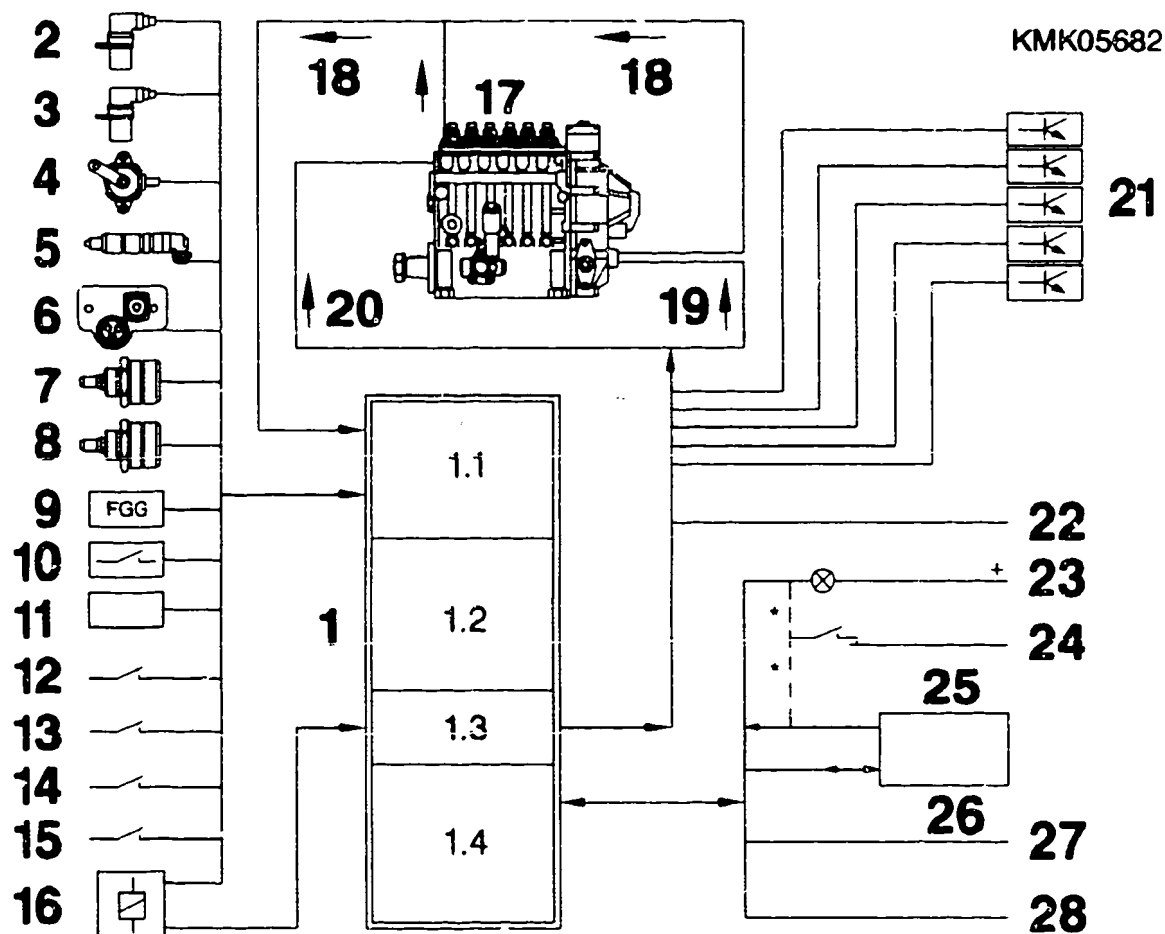
The potentiometer signal is indicated to the electronic control unit in the form of a driver request.

Determination of the correct injected-quantity and start-of-delivery variables for every operating condition involves the control unit processing information from peripheral sensor systems on driver requests (ignition key, accelerator position, various function switches) and on external influences (temperature of fuel/coolant/charge air, boost pressure, position of control rod, injection time, engine speed, vehicle speed etc.).

- 1 = Control unit MS5
 - 1.1 = Sensor evaluation
 - Atmospheric pressure
 - Signal inputs
 - Voltage supply
 - 1.2 = Signal processing
 - Amount of fuel
 - Start of injection
 - Monitoring
 - Diagnosis
 - Substitute functions
 - Adjustment
 - 1.3 = Output stages
 - Signal outputs
 - 1.4 = Interfaces
 - Diagnosis



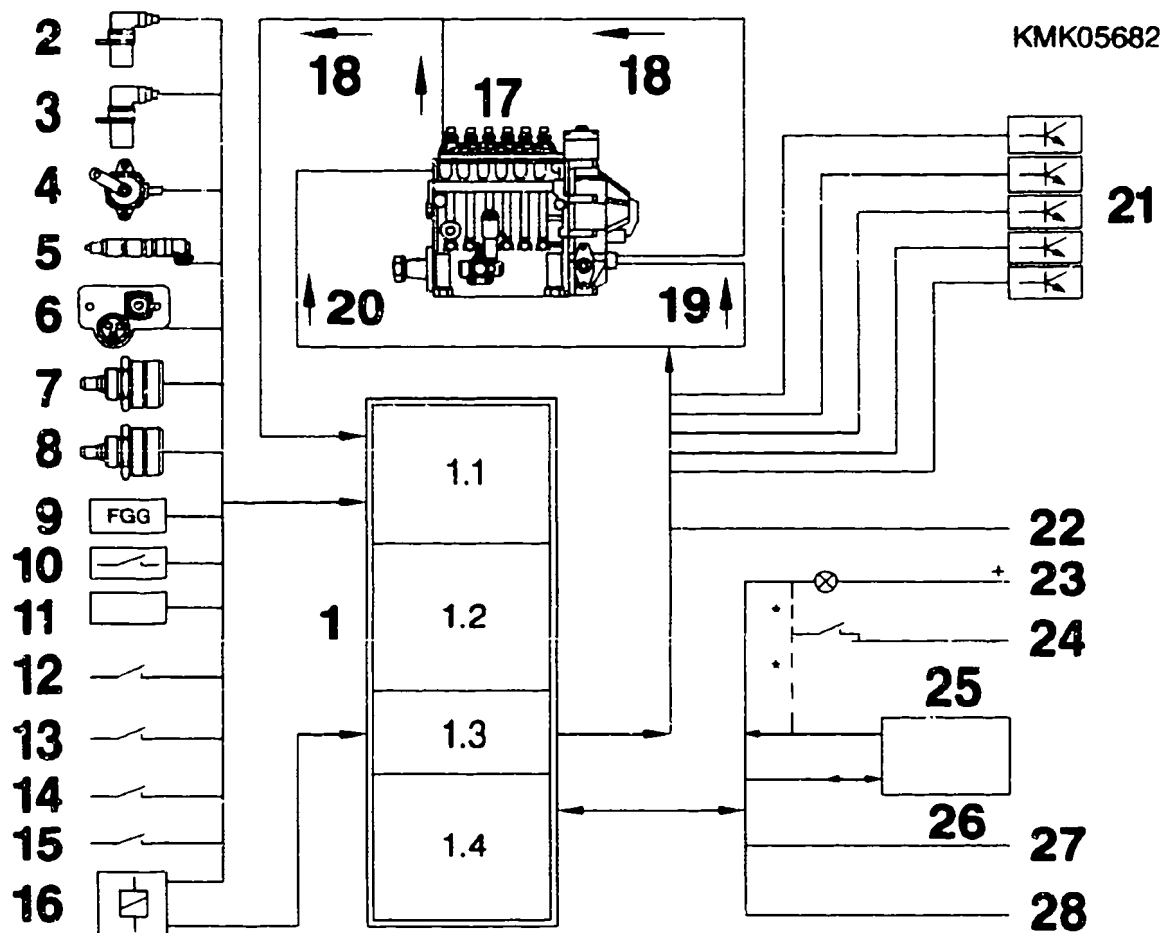
- 2 = Engine-speed sensor 1
- 3 = Engine-speed sensor 2
- 4 = Pedal-position sensor
with idle switch
- 5 = Start-of-injection sensor
- 6 = Boost pressure sensor
- 7 = Intake-air temperature sensor
- 8 = Coolant temperature sensor
- 9 = Vehicle-speed sensor
- 10 = Operating element for
cruise control
- 11 = Multi-stage switch
- 12, 13 = Brake switches
- 14 = Engine-brake switch
- 15 = Clutch switch
- 16 = Load-dump protection



- ```

17 = In-line pump RP43, RP39
18 = Signals: CRT, fuel temperature
19 = Actuation: injected-quantity,
 start-of-delivery adjuster
20 = Actuation: redundant shutoff
 (EHAB / ELAB)
21 = e.g. supercharger, engine brake
22 = TD signal
23 = Diagnosis lamp
24 = Diagnosis request
25 = ISO diagnosis
26 = EOL
27 = Asynchronous 2-wire interface
28 = CAN

```



To regulate the injected quantity, an RPS (half-differential inductive pick-up) installed in the RE positioner constantly determines the instantaneous CRT and supplies the values (U/actual value) to the control unit.

The input values are compared to the set values calculated from the stored data and correction takes place automatically if required.

The start of injection is regulated as a function of the signal from a needle-motion sensor (inductive pick-up) integrated into one of the nozzle-holder assemblies.

In addition to the basic function of injected-quantity and start-of-injection control as described above, the system also features the following functions:

Performance map, governor characteristics:

For driving, the system functions either as minimum or maximum speed governor (RQ characteristics) or for PTO as variable-speed governor (RQV characteristics).

## **Idle-speed regulation:**

The system features idle-speed regulation, so that the idle speed remains stable given changes in load, such as converter or concrete mixer or in the case of a cold engine.

This also means that the idle speed can be kept low.

On account of the idle-speed regulation it is also possible to start up the vehicle under load without pressing the accelerator pedal.

The regulated idle speed can subsequently be altered in the range between two specific limit speeds.

The limit speeds are project-related.

Adjustment is by way of a procedure involving the operating element for the cruise control.

Subsequent alteration of the idle speed established at the factory is not possible on vehicles with no operating element.

**Torque limitation, smoke limitation:**

To guard against overloading of the engine and power train and to avoid impermissible smoke generation, corrections are made as a function of coolant temperature, engine speed, boost pressure and (not a general feature) air temperature.

**Start process:**

Start quantity is output either when a lower start recognition speed (less than starting-motor speed) is exceeded or if the accelerator pedal is fully depressed.

For optimum cold starting and run-up of the engine, starting fuel delivery and starting rejection speed are established as a function of coolant temperature.

To avoid excessive engine wear after cold starting, the maximum possible engine speed can be restricted as a function of coolant temperature.

**Cruise control, intermediate speed control:**

Cruise control is part of the EDC system.

The corresponding operating element is located in the vicinity of the driver and has the following functions:

- \* Vehicle moving:  
Cruise control
- \* Vehicle stopped:  
Intermediate speed control
- \* Vehicle stopped:  
Adjustment of idle speed

NOTE on intermediate speed control:  
In addition to infinite adjustment by way of the operating element, up to three fixed speeds can be permanently programmed via external circuitry.

Restriction of maximum speed is permanently programmed and cannot be altered.

#### Self-diagnosis and safety system:

The EDC system is self-monitoring. This involves monitoring of the computer functions, the injected-quantity/start-of-injection adjuster and the sensors.

The task of the overall safety system is to safeguard driver, vehicle and engine in addition to facilitating fault determination.

The following measures are automatically initiated in line with the weighting of a given fault:

- \* Switching to suitable substitute function for continued (however restricted) driving with a view to reaching the nearest garage. If the control unit detects, for example, failure of the primary engine-speed sensor, switching is effected to an auxiliary sensor as redundant engine-speed signal.
- \* Immediate switch-off of engine if safety so dictates.

Depending on the fault involved, shutoff takes place by regulating the quantity injected to zero or by way of emergency shutoff involving deactivation of the positioner and the EHAB described below.

Emergency shutoff is effected by way of an electro-hydraulic shutoff device (EHAB) developed specially for the control-lever pump.

The EHAB is mounted on the injection pump and switched into the fuel inlet between supply pump and pump suction gallery.

The EHAB reverses the delivery direction of the supply pump, thus resulting in rapid dissipation of the suction-gallery pressure and interruption of the charge.

- \* Indication of certain faults by diagnosis lamp to warn driver.

#### **Diagnosis:**

Faults occurring are displayed by a diagnosis lamp and stored for subsequent determination.

#### **Fault storage involves**

- \* assignment of fault priority
- \* identification of type of fault
- \* detection of frequency
- \* establishment of marginal conditions at time of defect classification.

Depending on weighting (type of fault) the diagnosis lamp signals faults by flashing continuously, lighting permanently or remaining off.

If several faults are stored, "flashing" has priority over "continuously lit" and "continuously lit" priority over "off". Only current faults are indicated.

Stored faults of no current relevance are not indicated. The "continuous flashing" signalling method is not a general feature and is not found on certain vehicles.

There are two fault memories:

- \* Fault memory for diagnosis via ISO interface.  
This can only be read and cleared using an appropriate tester.
- \* Fault memory for diagnosis via flashing code.  
The flashing-code memory is read out by means of the diagnosis button installed in the vehicle.

Faults are always simultaneously stored in both memories and remain available even after switching the control unit off and on again.

Sporadic faults are decremented by a frequency counter the first time they disappear.

In other words, a certain frequency count is set and decremented by one whenever starting takes place.

If the fault no longer occurs, it is cleared on reaching zero.

The procedure for trouble-shooting with the diagnosis tester is described in detail in a special set of instructions.



For fault readout by way of flashing code, diagnosis button is to be pressed for at least 2 seconds. To detect any further faults which may have been stored, the prompt is to be repeated until the first displayed fault appears again.

The flashing code is a two-position code as shown in the adjacent diagram. The tens and units have to be added. A "0" in the tens signifies corresponding extension of the "off phase" prior to start of the units.

Clearing fault memory with diagnosis prompt button:

Switch on EDC (ignition) with button pressed.

After switch-on, keep button pressed for at least a further 2.5 seconds, however for a maximum of 10 seconds.

Releasing the button causes the fault memory to be cleared.

A = Diagnosis lamp

1 = ON

0 = OFF

2 = Interval 0.5 s

3 = Units ON 0.5 s

4 = Interval, tens/units 5 s

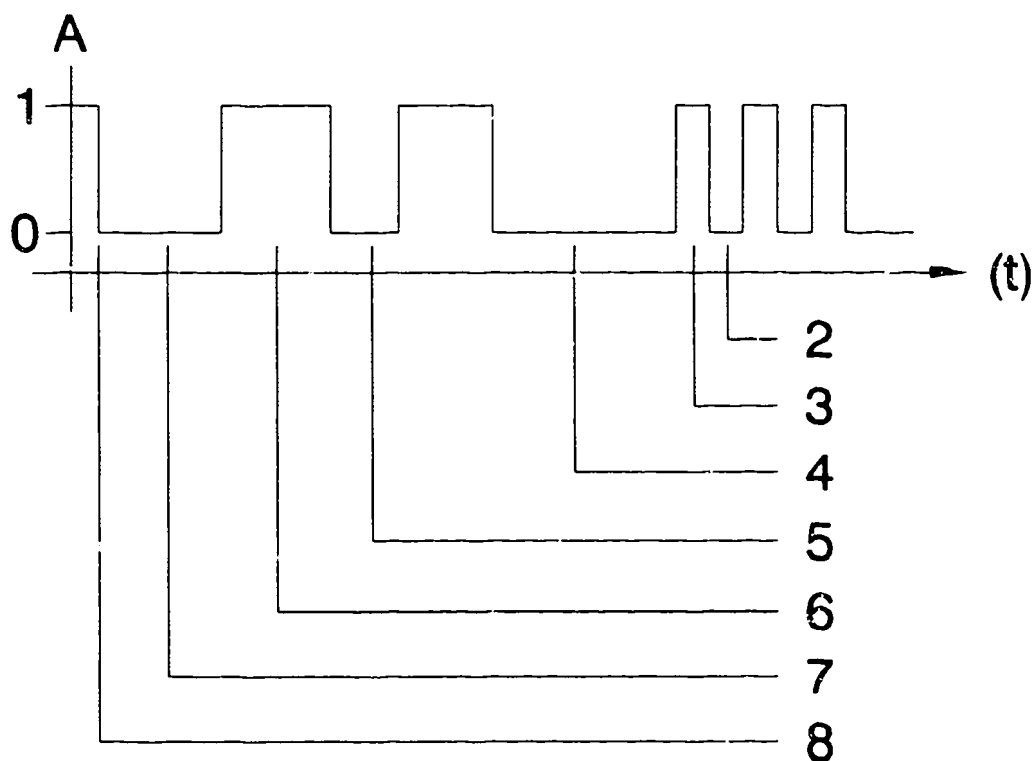
5 = Interval 1 s

6 = Tens 2 s

7 = Interval 3 s

8 = Release of diagnosis button

KMK05681



**Safety and limp-home program:**

**Substitute function:**

**Reduced full-load quantity**

**Cause:**

- \* Primary engine-speed sensor defective
- \* Auxiliary engine-speed sensor defective
- \* Needle-motion sensor defective
- \* Start-of-injection control: permanent system deviation
- \* Pedal-position sensor defective
- \* Incomplete run-on (in computer 1/computer 2)
- \* Run-on fault detected:
  - EHAB defective
  - Control unit fault (watchdog)

**Substitute function:**

**Reduced maximum speed:**

**Cause:**

- \* Primary engine-speed sensor defective
- \* Auxiliary engine-speed sensor defective
- \* Needle-motion sensor defective
- \* Start-of-injection control: permanent system deviation
- \* Pedal-position sensor defective
- \* Incomplete run-on
- \* Run-on fault detected:
  - EHAB defective
  - Control unit fault

**Substitute function:**  
**Shutoff with regulation to zero**

**Cause:**

- \* Primary and auxiliary engine-speed sensor defective
- \* RPS defective
- \* Injected-quantity control: permanent system deviation
- \* EOL operation
- \* Control unit fault  
(computer link defective)

**Substitute function:**  
**Shutoff with quantity output stage deenergized**

**Cause:**

- \* Primary and auxiliary engine-speed sensor defective
- \* RPS defective
- \* Injected-quantity control: permanent system deviation
- \* EOL operation
- \* Control unit fault  
(computer link defective)
- \* Excess speed detected

**Substitute function:  
Redundant shutoff by EHAB  
(deenergized)**

**Cause:**

- \* RPS defective
- \* Injected-quantity control:  
permanent system deviation
- \* EOL operation

**Notes on trouble-shooting:**

Self-diagnosis with diagnosis tester via ISO interface/flashing code enables malfunctions/defective components to be determined.

Trouble-shooting is initiated in two stages:

1. Interrogation of self-diagnosis, elimination of faults indicated and clearance of fault memory.

2. If self-diagnosis does not indicate any faults, but complaint still exists, fault determination in line with symptoms as per trouble shooting chart and elimination on the basis of trouble-shooting instructions (in preparation).

Trouble-shooting testers and tools:  
Low-pressure and high-pressure system do not differ from mechanical injection systems with P-pump (exception: EHAB function).  
EDC-specific testers and tools are thus not required.

All electrical checks (cables and components) can be performed with individual test leads, standard multimeter and oscilloscope for needle-motion sensor.

## **Injection-pump assembly:**

**The repair/test instructions, test specifications and special tools required for repair, testing and adjustment of injection pump and positioner will be available as of September/October 1994.**

## **Published by:**

**Robert Bosch GmbH  
Division KH  
After-Sales-Service Department for  
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P-PUMP AND  
TWO-STAGE LDA

Workshop: EP  
12.1994  
ST 0457 En

Injection-pump and/or governor conversion on Mercedes-Benz engines of series 400

In the case of engines equipped with the following IP/governor assemblies, governor and/or injection pump is/are always to be converted if complaints are received.

|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 648 898  |
|                   | 0 402 648 906  |
|                   | 0 402 648 908  |
|                   | 0 402 648 918  |
| Pump designation: | PE..LS 7838 or |
|                   | PE..LS 7838-10 |
|                   | -----          |
| Assembly number:  | 0 402 648 893  |
|                   | 0 402 648 894  |
|                   | 0 402 648 895  |
|                   | 0 402 648 914  |
|                   | 0 402 648 915  |
| Pump designation: | PE..LS 7835 or |
|                   | PE..LS 7835-10 |



|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 648 900  |
|                   | 0 402 648 901  |
|                   | 0 402 648 909  |
|                   | 0 402 648 910  |
| Pump designation: | PE..LS 7840 or |
|                   | PE..LS 7840-10 |

|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 646 921  |
|                   | 0 402 646 924  |
|                   | 0 402 646 925  |
|                   | 0 402 646 931  |
|                   | 0 402 646 942  |
|                   | 0 402 646 950  |
| Pump designation: | PE..LS 7837 or |
|                   | PE..LS 7837-10 |

|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 646 917  |
|                   | 0 402 646 926  |
|                   | 0 402 646 929  |
|                   | 0 402 646 922  |
|                   | 0 402 646 954  |
|                   | 0 402 646 930  |
| Pump designation: | PE..LS 7834 or |
|                   | PE..LS 7834-10 |

|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 646 952  |
|                   | 0 402 646 953  |
|                   | 0 402 646 957  |
|                   | 0 402 646 958  |
|                   | 0 402 646 915  |
|                   | 0 402 646 916  |
|                   | 0 402 646 939  |
|                   | 0 402 646 940  |
|                   | 0 402 646 959  |
|                   | 0 402 646 960  |
| Pump designation: | PE..LS 7836 or |
|                   | PE..LS 7836-10 |

|                   |                |
|-------------------|----------------|
| Assembly number:  | 0 402 746 913  |
|                   | 0 402 746 916  |
|                   | 0 402 746 919  |
| Pump designation: | PE..LS 7237 or |
|                   | PE..LS 7237-10 |

These conversion measures are listed in the following Service Infos:

1. RQ(V)..PA

Mercedes-Benz series 400 with  
P-pump and two-stage LDA,  
low power  
(see W-400/0..).

2. MB-NKW, engine series 400

Mercedes-Benz comm.-veh. engines,  
series 400,  
OM 402 LA, OM 442 LA, ..  
(see NKW-0..).

For adjusting injection-pump/governor  
assembly use may o n l y be made of  
test-specification sheets with letter X  
after assembly number.

Costs of conversion are to be billed.

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Robert Bosch GmbH

Division KH

After-Sales-Service Department for  
Training and Technology (KH/VSK)

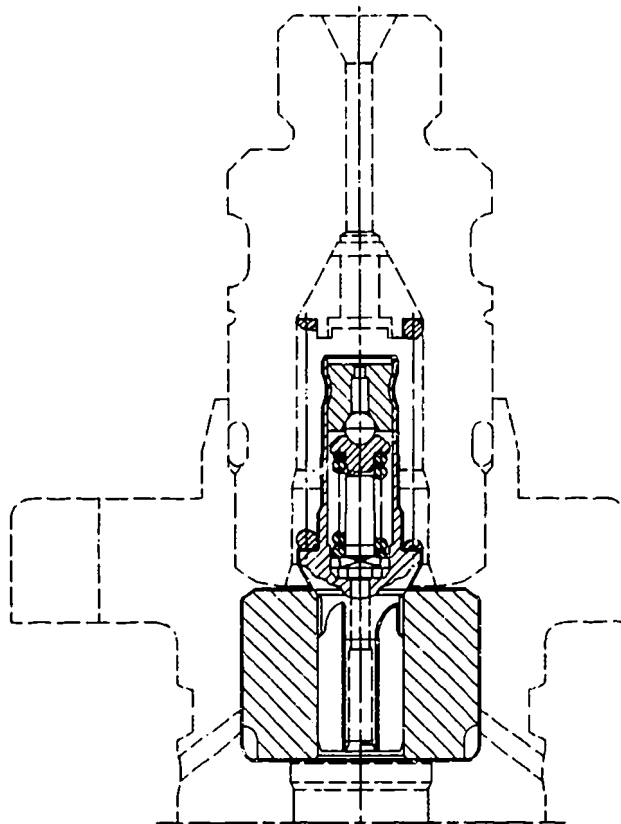
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country

Constant pressure valve (GDV)  
Design and operation

The constant pressure valve (fig. -  
cutaway view) is part of the barrel-  
and-valve assembly.

It represents the connection between  
the actual pump chamber and the fuel-  
injection tubing.

KMK05720



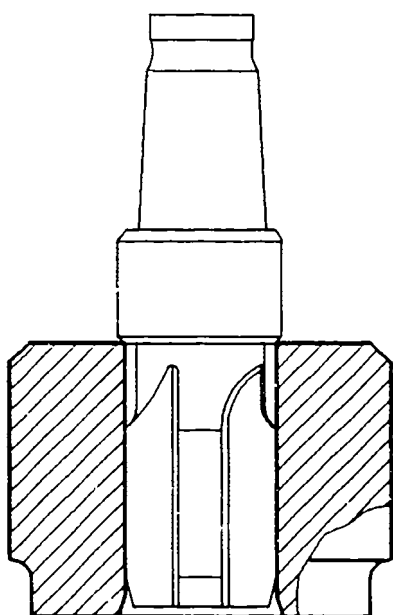
## TASKS

The constant pressure valve

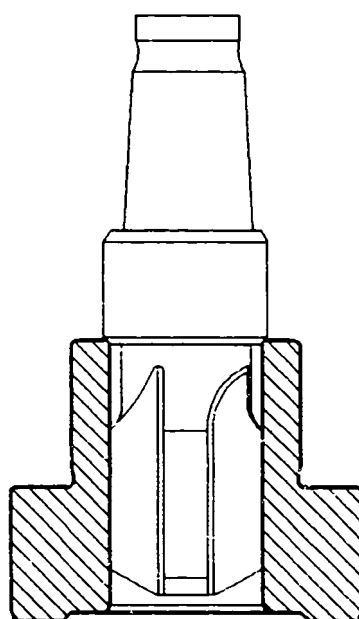
- \* stops the high-pressure tubing running empty between the individual injection operations;
- \* shapes the profile of the injected quantity versus speed with constant injection-pump effective stroke;
- \* has a crucial influence on pressure fluctuation in the injection system after completion of injection. Such fluctuation can cause post-injection and cavitation.

Fig. a = GDV barrel valve

Fig. b = GDV collar valve



a



b

KMK04503

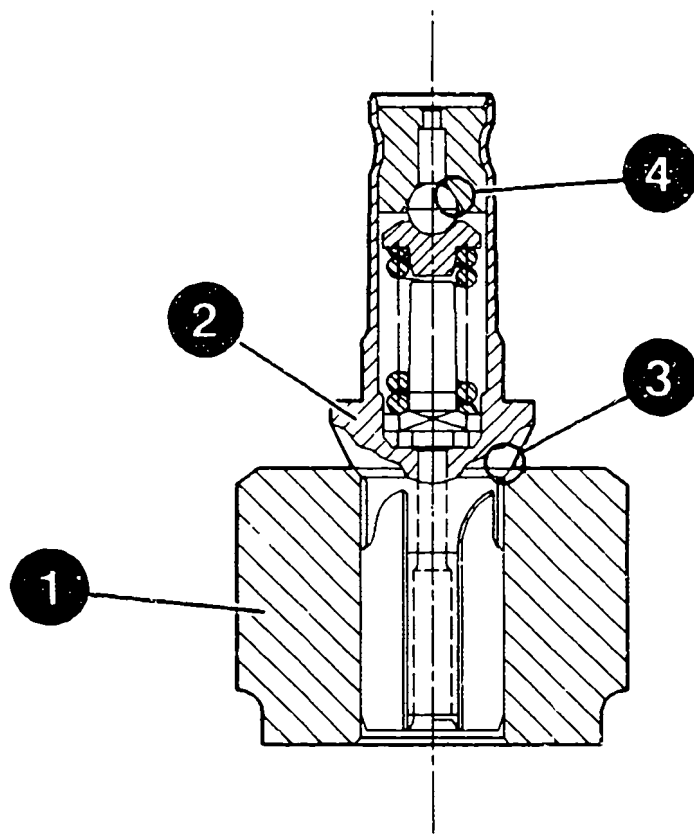
## DESIGN

1 = Valve body

2 = Valve cone

3 = Sealing surface, valve cone

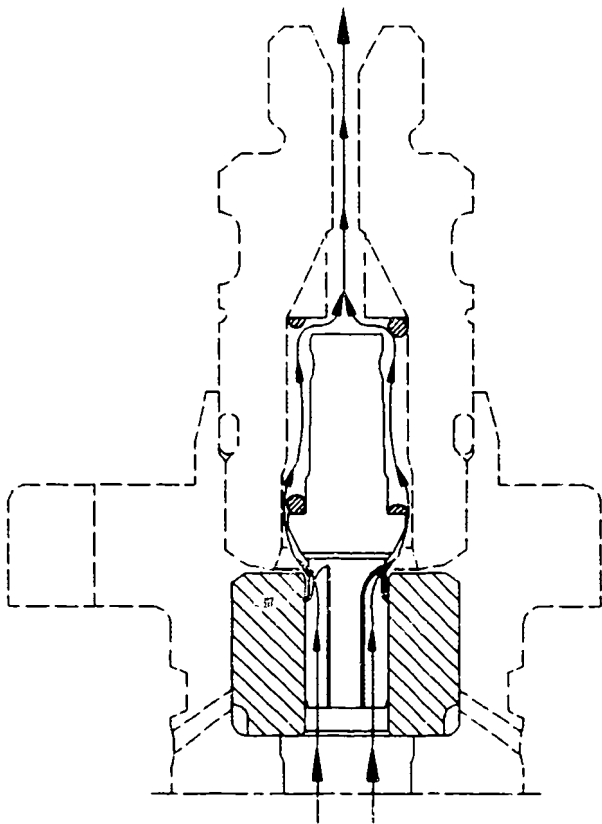
4 = Seat, ball valve



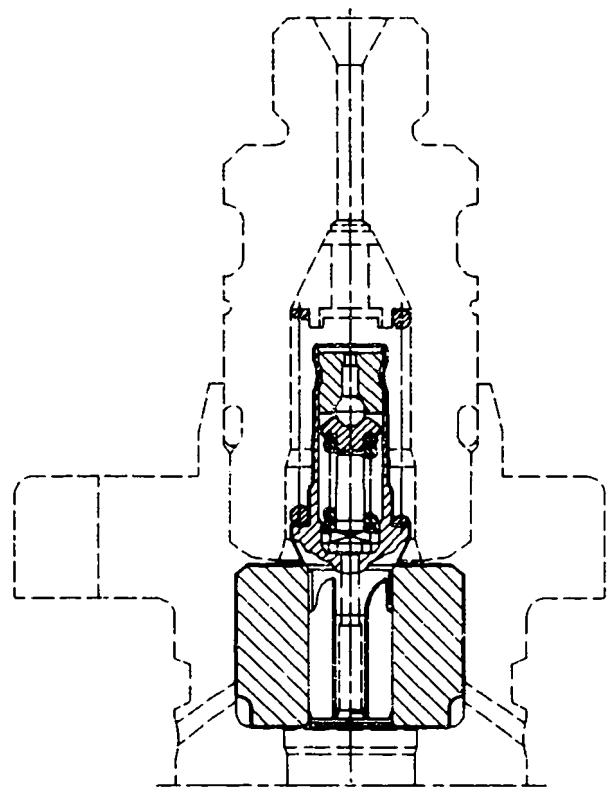
KMK05721

On commencement of the effective stroke of the injection pump, the valve cone is pressed out of the seat and fuel flows through the GDV, the delivery-valve holder and the fuel-injection tubing to the injection nozzle.

Fig. a: Arrows = Direction of fuel flow  
Fig. b: GDV cutaway drawing



**a**



**b**

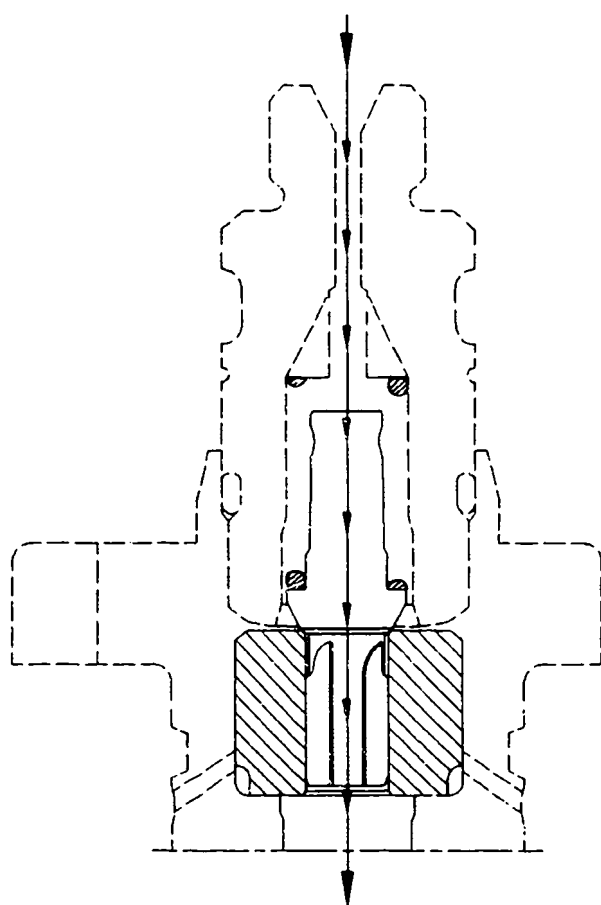
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At the end of injection, the pressure drops off on the pump end and the GDV closes.

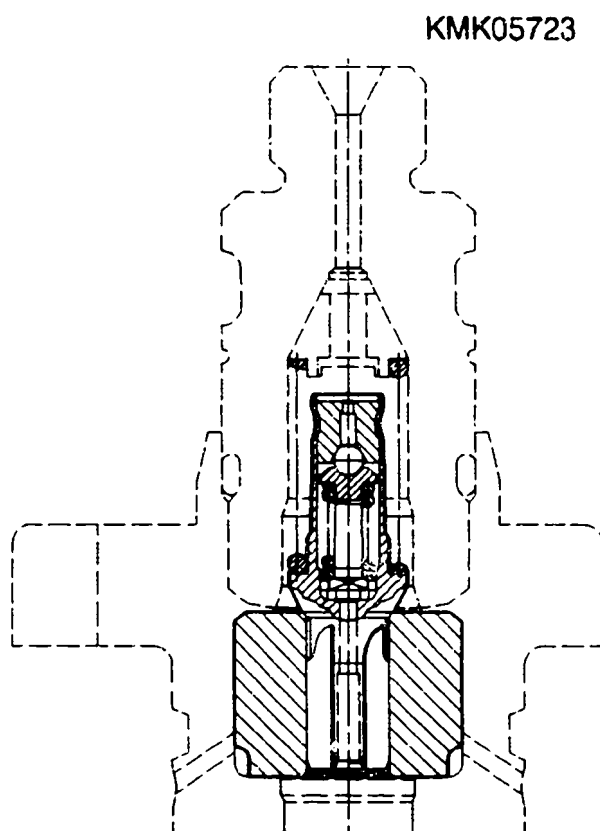
In order to generate sufficient injection pressure, more fuel flows through the GDV than is squirted through the nozzle. The surplus fuel in the injection tubing can then flow off via the ball valve in the valve cone.

This produces a low residual pressure in the fuel-injection tubing so that the needle valve closes quickly at the end of injection.

Fig. a: Arrows = Direction of fuel flow  
Fig. b: GDV cutaway drawing



a



b



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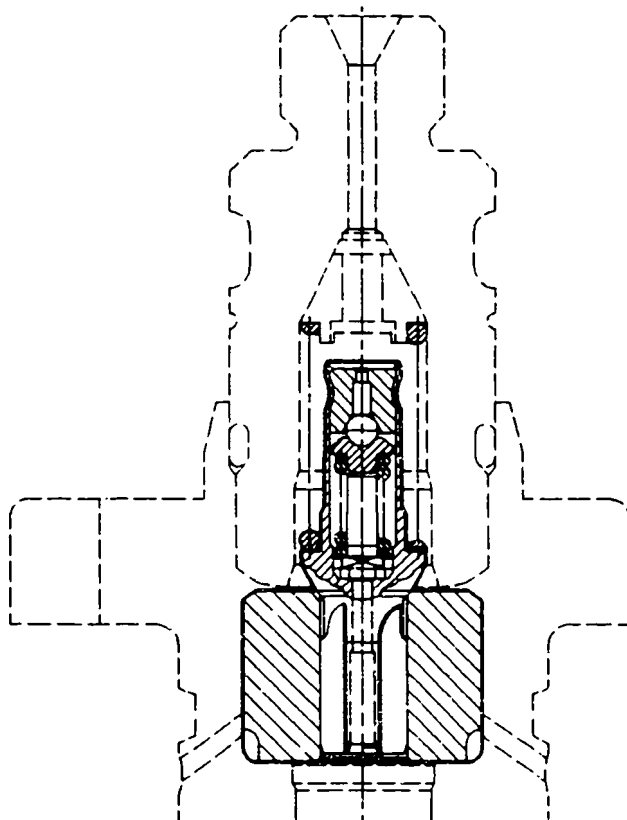
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**Constant pressure valve - GDV**  
**Functional description and testing**

The constant pressure valve (fig. - cutaway view) is part of the barrel-and-valve assembly.

It represents the connection between the actual pump chamber and the fuel-injection tubing.

KMK05720



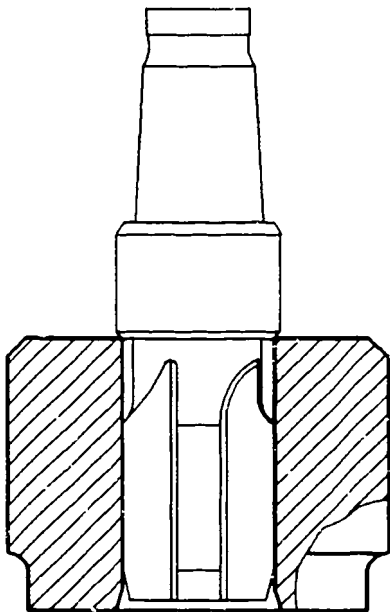
## TASKS

The constant pressure valve

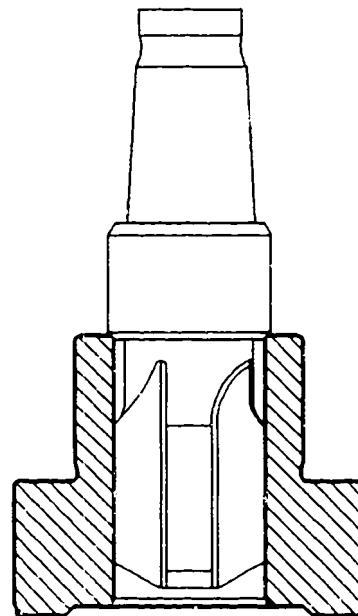
- \* stops the high-pressure tubing running empty between the individual injection operations;
- \* shapes the profile of the injected quantity versus speed with constant injection-pump effective stroke;
- \* has a crucial influence on pressure fluctuation in the injection system after completion of injection. Such fluctuation can cause post-injection and cavitation.

Fig. a = GDV barrel valve

Fig. b = GDV collar valve



a



b

KMK04503

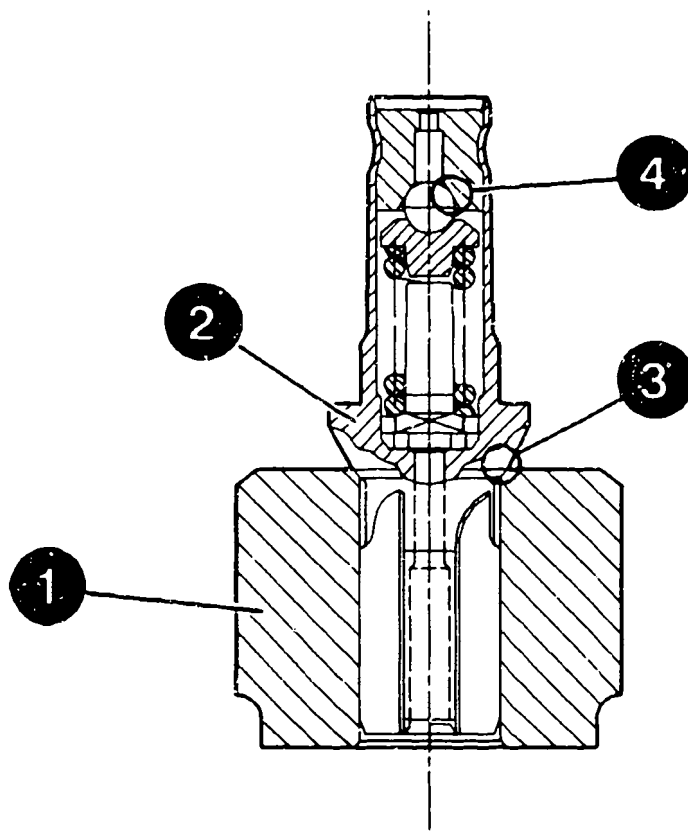
## DESIGN

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2 = Valve cone

3 = Sealing surface, valve cone

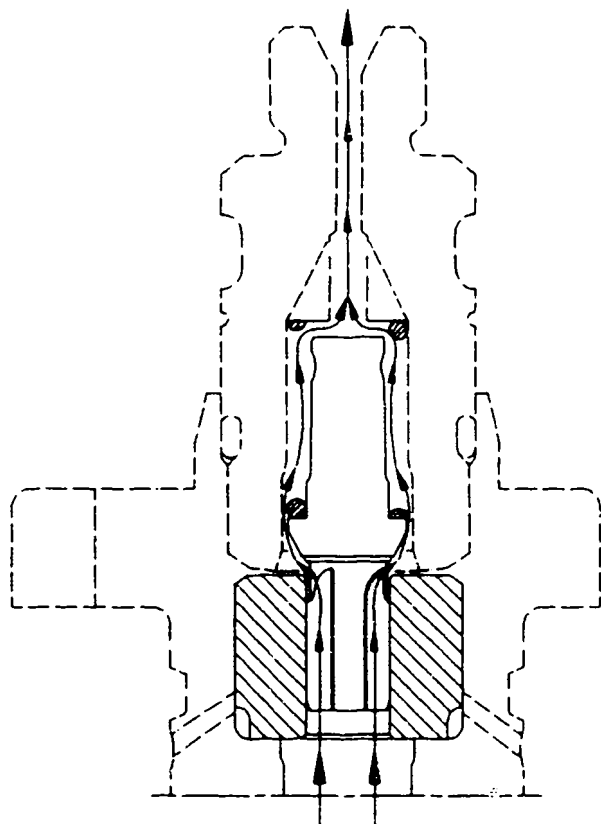
4 = Seat, ball valve



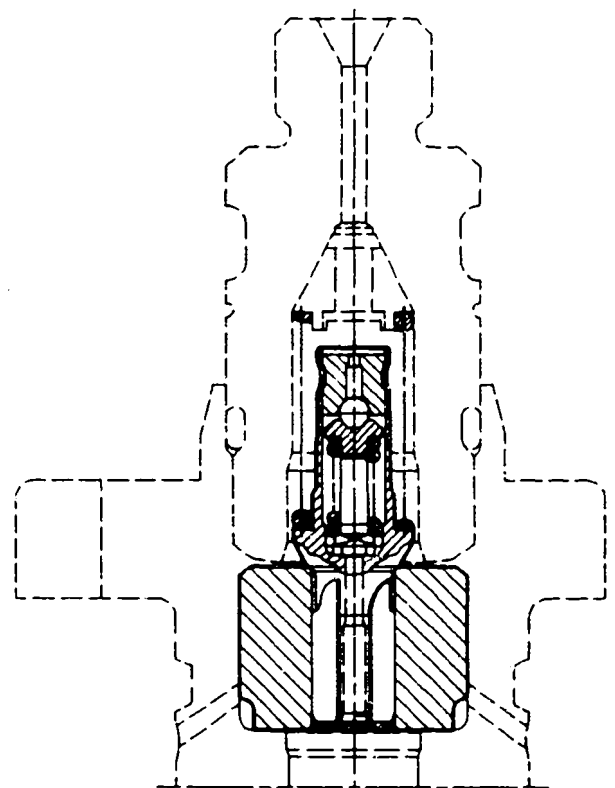
KMK05721

On commencement of the effective stroke of the injection pump, the valve cone is pressed out of the seat and fuel flows through the GDV, the delivery-valve holder and the fuel-injection tubing to the injection nozzle.

Fig. a: Arrows = Direction of fuel flow  
Fig. b: GDV cutaway drawing



**a**



**b**

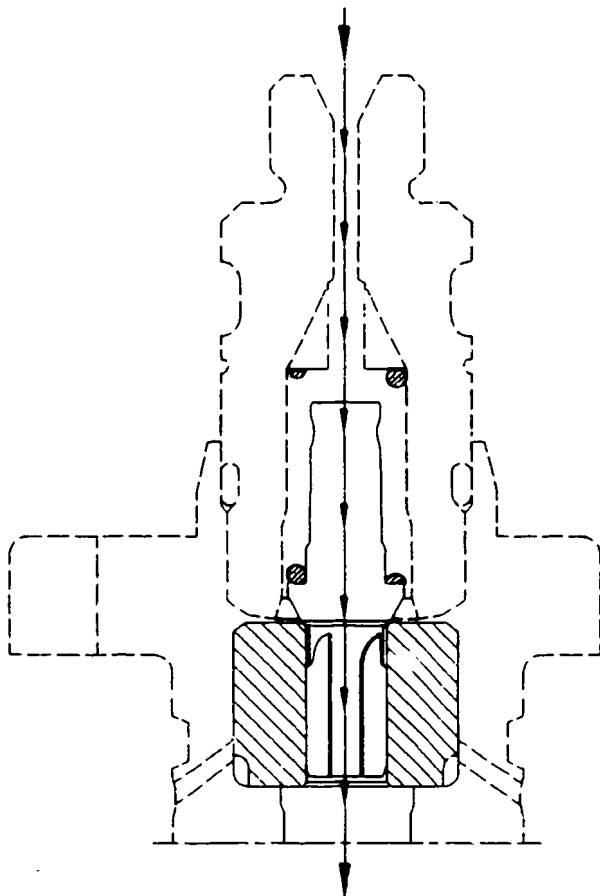
KMK05722

At the end of injection, the pressure drops off on the pump end and the GDV closes.

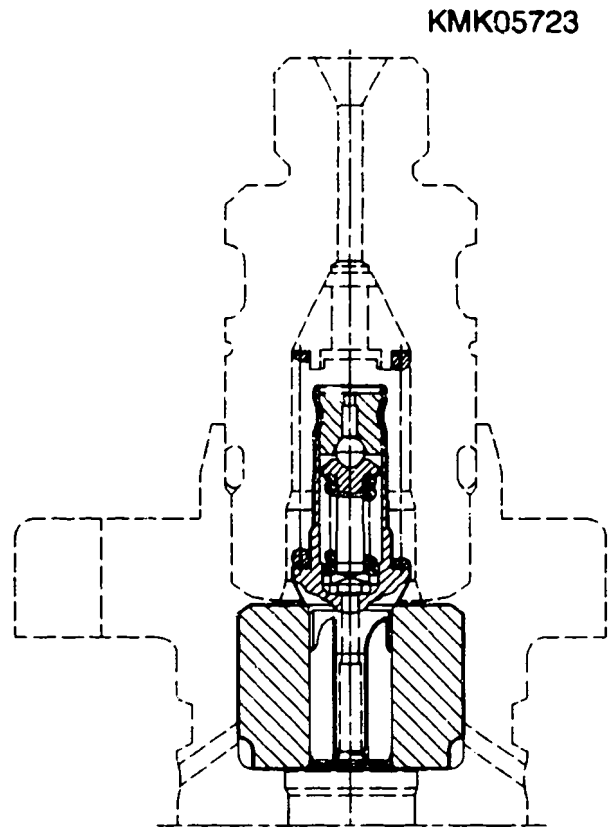
In order to generate sufficient injection pressure, more fuel flows through the GDV than is squirted through the nozzle. The surplus fuel in the injection tubing can then flow off via the ball valve in the valve cone.

This produces a low residual pressure in the fuel-injection tubing so that the needle valve closes quickly at the end of injection.

Fig. a: Arrows = Direction of fuel flow  
Fig. b: GDV cutaway drawing



**a**



**b**

## TESTING CONSTANT PRESSURE VALVE

GDV testing is performed if major fluctuations in injected quantity are established at the injection pump on a test bench despite the fact that the plunger-and-barrel assembly is in proper hydraulic working order. A check is made on the following items:

Opening pressure of ball valve:

This is used to establish the pressure at which the ball is pressed out of its seat and the valve opens.

Leakage:

This is used to simultaneously check the freedom from leaks of conical seat and ball valve.

Testing of opening pressure and leakage requires utilization of the

PRESSURE TESTER

0 986 612 619

The constant pressure valve CANNOT be checked without this tester.

The GDV is not always the cause of injected-quantity fluctuation.

The operations described below are to be performed in the given sequence so as to preclude other possible factors producing injected-quantity scatter.

- \* Testing of IP assembly in line with test-specification sheet

A defective GDV primarily causes injected-quantity fluctuation in the idle range.

It is therefore particularly important to pay attention to the fluctuation in idle quantity injected.

Finding: Injected-quantity fluctuation

- \* Replace calibrating nozzle-holder assembly (calibrating DHK)

The calibrating DHK are to be checked if the above does not cure the fault. To do so, consecutively connect all calibrating DHK to one pump barrel and check them.

The test items in each case are the idle and full-load quantity as per test-specification sheet.

-> Repair defective DHK.

- \* Renewed checking of IP assembly

Finding: Injected-quantity fluctuation



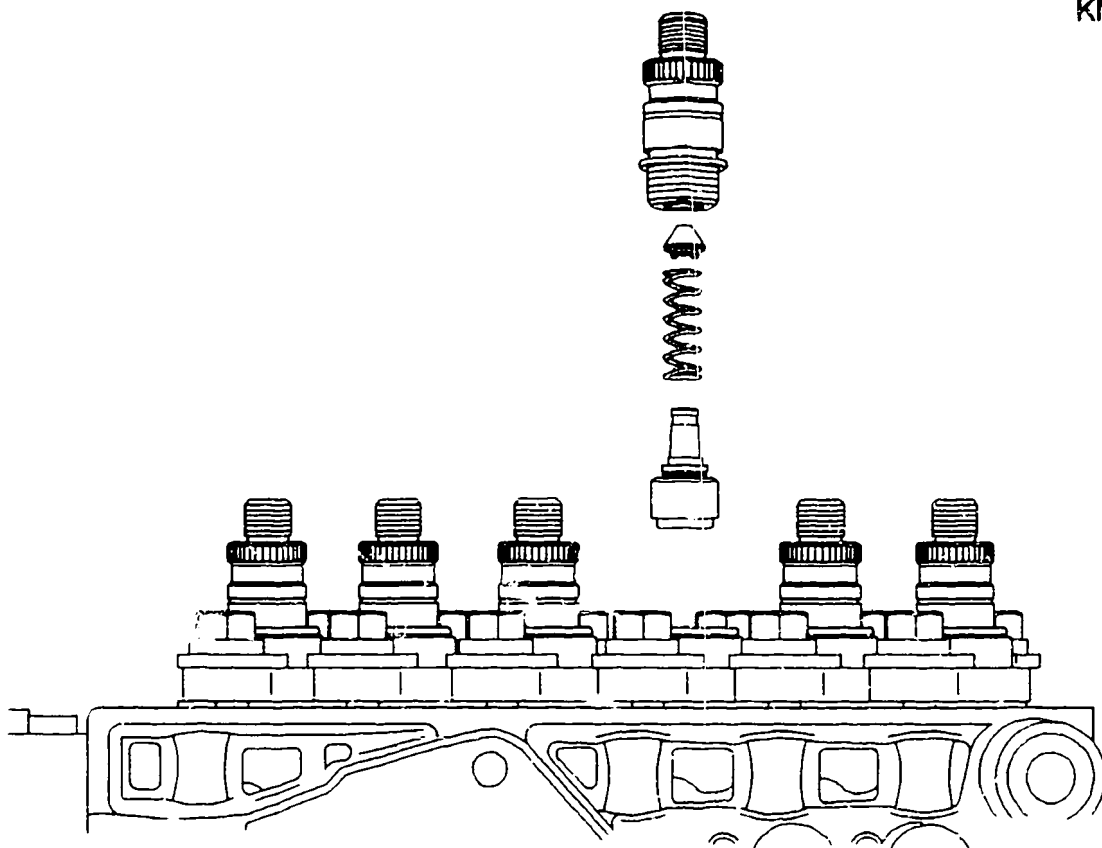
**\* Check constant pressure valve**

A check is however only to be made on the GDV which are not within the injected-quantity tolerance (scatter) when testing the pump. Correct barrels remain fitted.

Loosen delivery-valve holder of pump with socket wrench 0 986 612 356 and screw out (leave O-ring on delivery-valve holder). Remove spring seat, valve spring, GDV and bronze/steel sealing ring from plunger-and-barrel assembly.

Pumps with "hard seal" have NO seal between assembly and GDV (fig.).

KMK05724



Clamp pressure tester 0 986 612 619  
in vise.

Insert bronze gasket in pressure  
tester.

Injection pumps of size

P-3000, P-7100, P-7800, P-8000

P-8500, R pump and H pump

all require bronze gasket

2 410 105 005.

It is advisable to have several gaskets  
in stock. Bronze gasket can only be  
used O N C E.

For injection pumps with "hard seal",  
use is likewise to be made of gasket  
in line with part number above.

The assemblies of injection pumps of  
size P-3000 have a different design  
to others. It is therefore important to  
pay attention to the following when  
placing constant pressure valves in  
pressure tester:

Bronze gasket (2 410 105 005) is not  
to be fitted ON the constant pressure  
valve in the injection pump as is  
usually the case, but rather  
BENEATH IT.

The application governs whether a  
small or large GDV is installed  
(refer to next page for differences).

The pump delivery-valve holder cannot be used for any of the stated constant pressure valves (different thread size from pressure tester).

Use delivery-valve holder

2 413 371 243 for small GDV and

2 413 371 230 for large GDV.

The O-ring 2 410 210 033 applies to both delivery-valve holders.

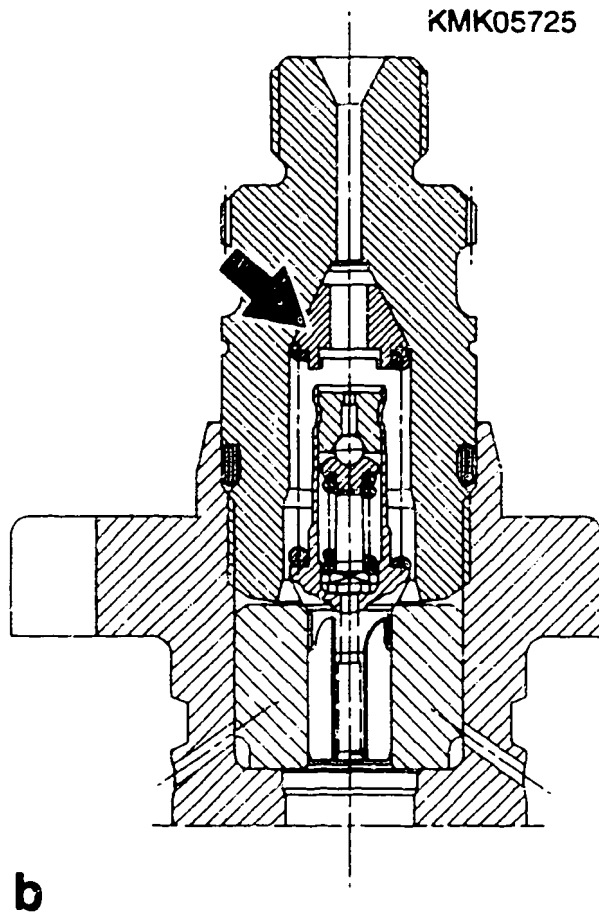
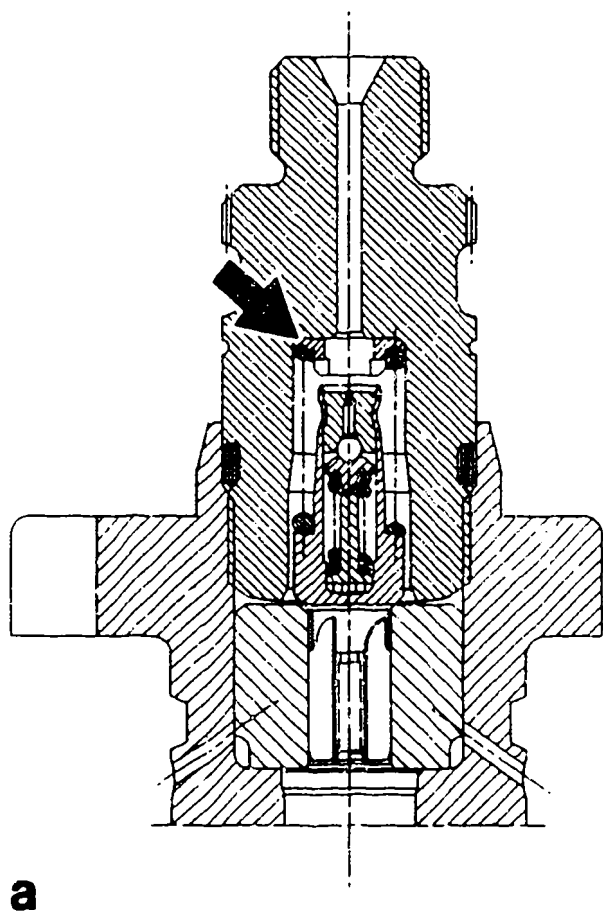
The distinguishing feature in each case is the built-in spring seat.

\* Small spring seat  
(flat spring seat)

--> fig. a

\* Large spring seat  
(pointed spring seat)

--> fig. b

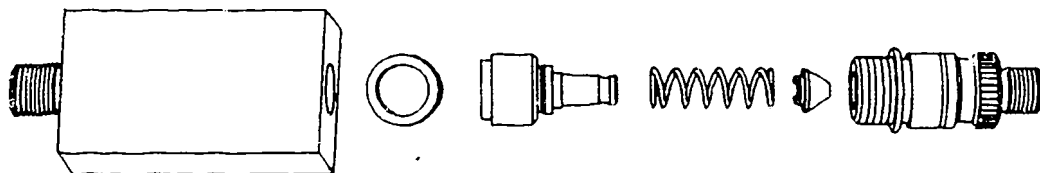


Thoroughly wash out constant pressure valve.

Provide pressure tester with constant pressure valve, valve spring, spring seat and delivery-valve holder.

Tighten delivery-valve holder with torque wrench to 90...100 Nm.

KMK05726



# O p e n i n g   p r e s s u r e   t e s t

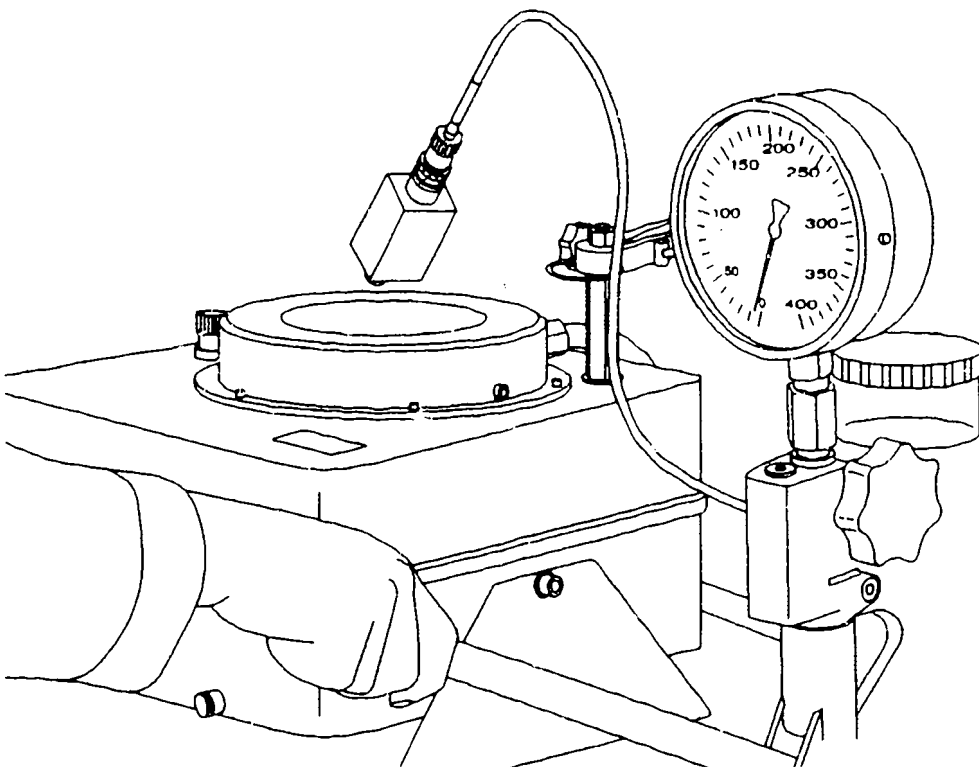
Connect pressure tester at delivery-valve holder to nozzle tester.

Attention: Observe safety instructions  
for working on nozzle tester

Open shutoff valve at pressure gauge roughly one quarter of a turn.  
Slowly depress hand lever of nozzle tester, thus causing pressure on gauge to increase.

Note the pressure at which the gauge pointer abruptly drops off again.

KMK05727



The maximum pressure attained is the opening pressure of the constant pressure valve.

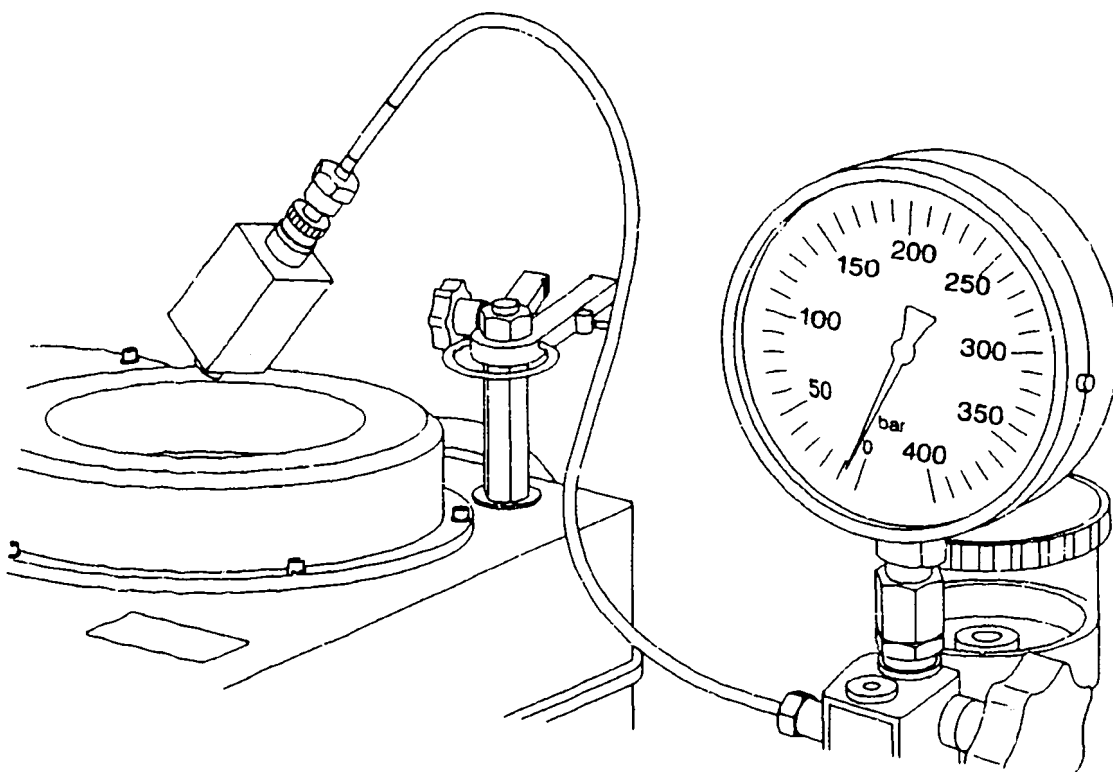
The current series employs two different GDV opening-pressure versions:

| GDV version | Opening press. tolerance |
|-------------|--------------------------|
| 70 bar      | 60... 75 bar             |
| 110 bar     | 95...115 bar             |

If opening pressure is not within stated tolerance, scrap GDV and replace it with a new one.

If no fault is found, perform leak test as described in the following.

KMK05728



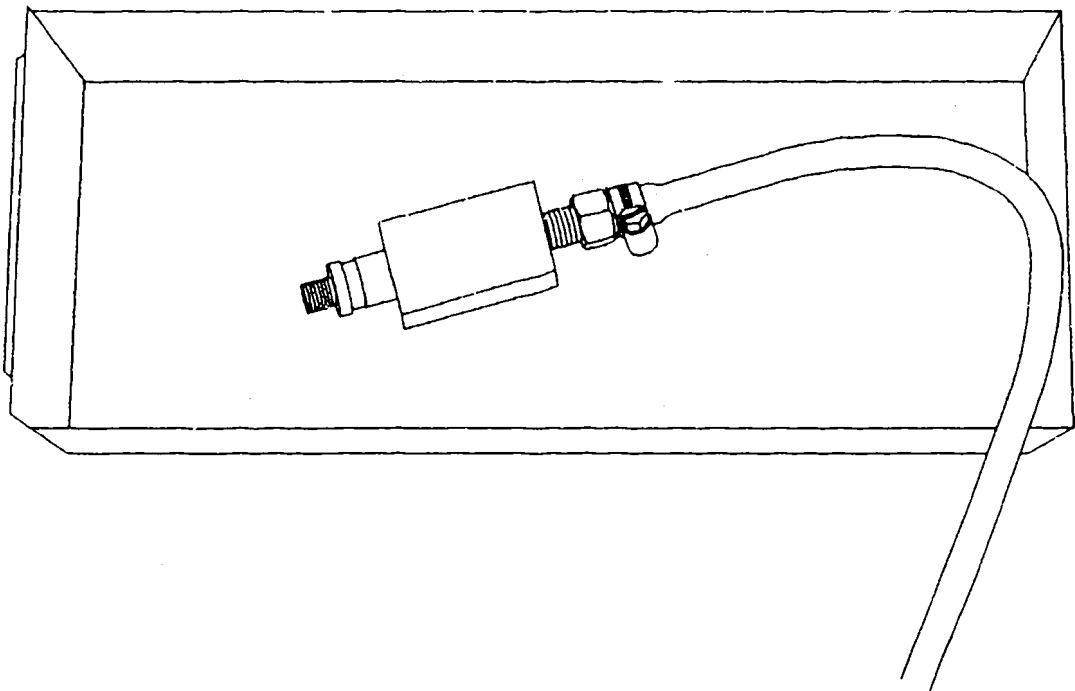
## L e a k   t e s t

Connect pressure hose (air) to M 14 x 1.5 threaded nipple of pressure tester and apply 2.5 bar compressed air.

After dwell time of 1 minute immerse pressure tester in leak-test bath. Up to 20 air bubbles may escape from the delivery-valve holder within 10 seconds.

If more than 20 air bubbles escape, scrap the GDV and replace it with a new one.

KMK05729



If no fault is found, re-install constant pressure valve in pump.

On assembly, use new bronze/steel gasket and new O-ring for delivery-valve holder (refer to pump service parts list for part numbers).

As regards installation instructions for "hard seal" and tightening torque of delivery-valve holder, refer to repair instructions or service info for corresponding injection pump.

Check injected-quantity fluctuation again.

If fault is no longer found, the problem was caused by GDV torsion resulting from inexpert tightening of the delivery-valve holder.

Renew constant pressure valve if there are still fluctuations in the quantity injected. In this case the fault concerned is one which cannot be determined with service testers.



**Full list of components required for  
GDV testing:**

|                       |   |     |     |     |
|-----------------------|---|-----|-----|-----|
| Pressure tester       | 0 | 986 | 612 | 619 |
| Delivery-valve holder | 2 | 413 | 371 | 230 |
| Delivery-valve holder | 2 | 413 | 371 | 243 |
| Bronze gasket         | 2 | 410 | 105 | 005 |
| O-ring                | 2 | 410 | 210 | 033 |

**IMPORTANT:**

**GDV TESTING DESCRIBED ONLY APPLIES TO  
REPAIR SITUATIONS.**

**IT IS NOT TO BE EMPLOYED FOR INCOMING  
INSPECTION WITH ORIGINAL EQUIPMENT  
CUSTOMERS.**

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## CHECKING IN-LINE PUMPS

Workshop: EP  
03.1995  
ST 0465 En

Explanatory notes on new  
test-specification sheet

In the course of general conversion to machine production of test-specification sheets by KH/VSK, the existing sheet has been revised.

These test-specification sheets will be distributed with the next microcard issue.

What changes have been made?

1. The test-specification sheet will start with the important reference to "Service Info on testing/adjustment instructions on microcards W-400/.." .
2. A clear-cut breakdown has been achieved through the introduction of sections. Each section starts with a HEADING and is additionally delimited by a line at the beginning and end.

3. Within the section there are blocks designed to further enhance clarity and legibility.
4. The "remarks" texts are on the first page of the test-specification sheet, thus obviating the need to "jump" to the end of the sheet.
5. All delivery data with the exception of the overflow quantity are given in cm<sup>3</sup>/1000 strokes.

6. Value-range data XX...YY have been replaced by tolerance data (-/+).

Example:

\* O l d

CRT mm: 7.1...7.3

\* N e w

CRT mm: 7.2 +- 0.1

7. Section: TEST BENCH PREREQUISITES

- \* The perforated-plate data on calibrating nozzle-holder assembly have been dispensed with. Data can be taken from product descriptions of IA4 or from microcard W-400/002.
- \* The dimensions for test-pressure lines are now given in line with standard.

## 8. Section: BASIC SETTING

- \* In future there may be two blocks for basic setting (underlined data) and one block for testing.
- \* As regards adjustment/testing of RVI injection-pump/governor assemblies the CRT given here (basic CRT) is used to calculate the CRTs in the following sections.

Formula:

Basic CRT  
- CRT of test point  
= CRT to be set.

Example:

|                     |         |
|---------------------|---------|
| Basic CRT           | 14.0 mm |
| - CRT of test point | 6.5 mm  |
| = CRT to be set     | 7.5 mm  |

## 9. Section: SETTINGS FOR INJECTION PUMP WITH BUILT-ON GOVERNOR

- \* Data are always listed for:
    - Sliding sleeve travel
    - and sliding sleeve position.
- This does not alter the governor-specific setting.

**10. Section: MAXIMUM AND MINIMUM  
RATED SPEED**

**\* Two control-lever positions  
may be quoted per section.  
The values are to be assigned  
to the protractor to be used  
as follows:**

- Angle > 90 Grad:  
applies to  
1 688 130 183**
- Angle < 90 Grad:  
applies to  
0 681 440 006**

**One further n o t e to finish with:**

**Please take a look at a  
"new test-specification sheet"  
and familiarize yourself with the  
changes outlined in this info  
sheet.**

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IN-LINE PUMPS PE (S) ..

Workshop: EP

03.1995

SI 0468 En

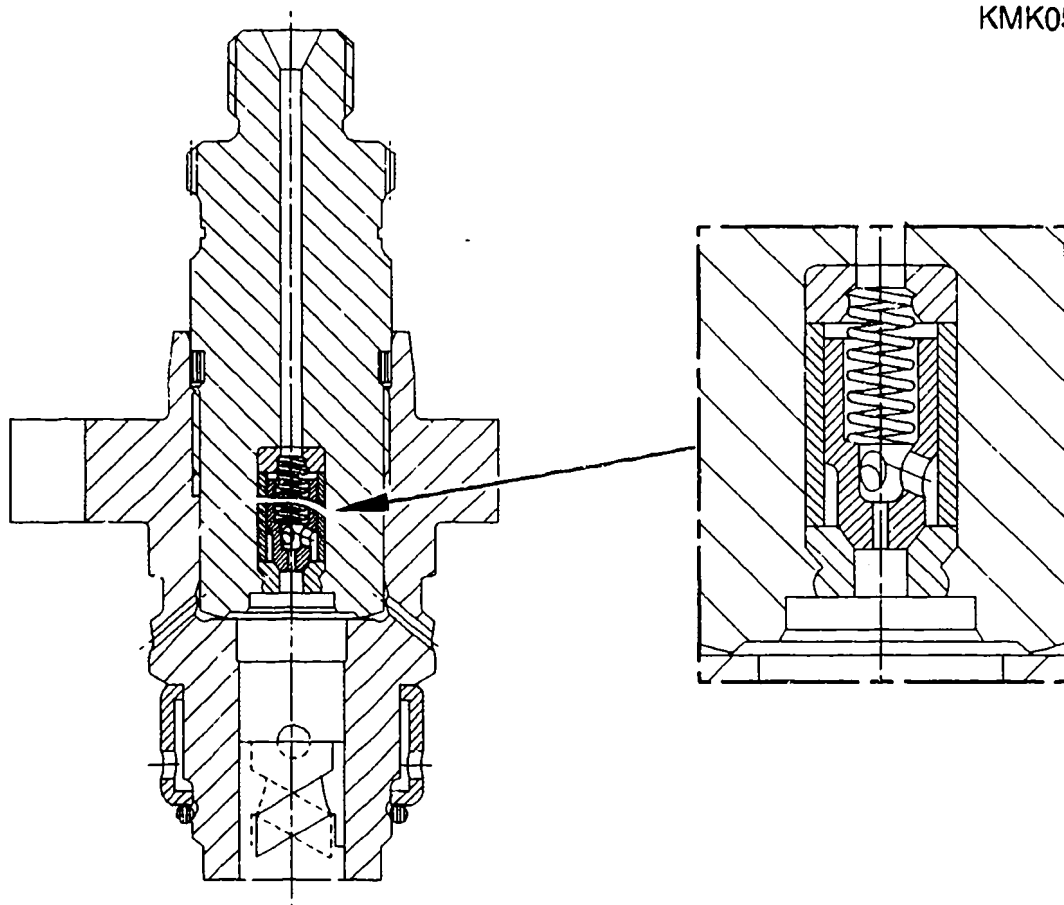
Snubber valve (RDV)

Design and mode of operation

With certain new adjustments to in-line pumps of sizes P, R and H use is made of the newly developed snubber valve (RDV) (fig. - section).

This measure makes it possible to dispense with the delivery valve used to date.

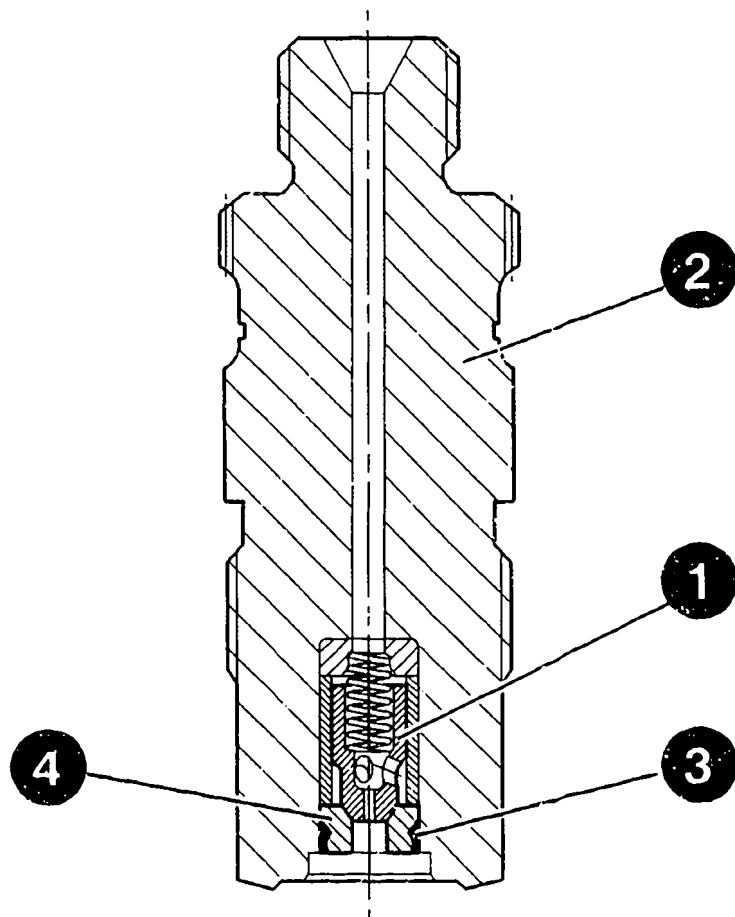
KMK05782



The snubber valve is permanently riveted to the delivery-valve holder. Valve and delivery-valve holder form a unit.

The two components are thus referred to in this Service Info as "RDV unit" (fig.).

- 1 = Snubber valve
- 2 = Delivery-valve holder
- 3 = Riveted joint
- 4 = Valve seat



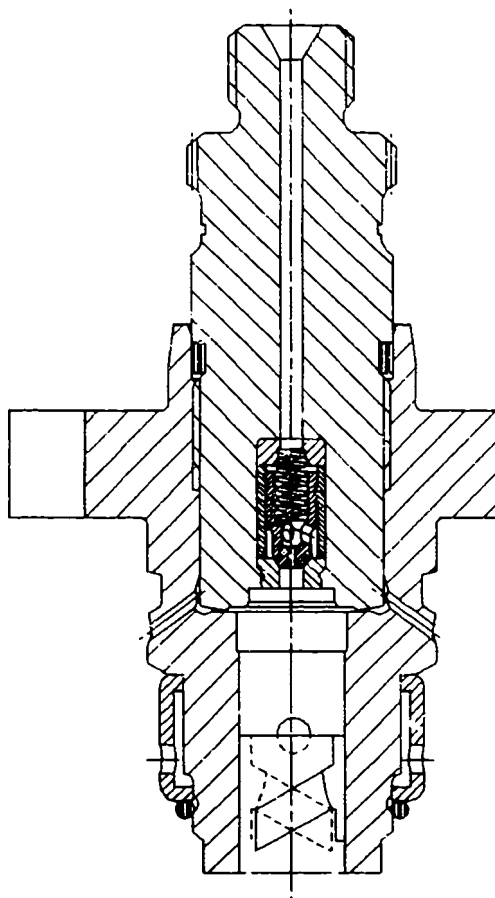
KMK05783



On standard in-line pumps the delivery valve separates the actual pump chamber from the injection tubing.

When use is made of the RDV the system is "open", i.e. when the pump plunger is in the prestroke phase or during retraction lift, the static pressure of the injection tubing corresponds to the pump suction-gallery pressure.

In order to be able to maintain an appropriate fuel pressure level in the injection tubing, the suction-gallery pressure had to be increased to at least 300 kPa (3 bar).



KMK05784

When checking and adjusting the injection pump particular attention is therefore to be paid in future to the fuel inlet pressure given in the test-specification sheet.

Precise quantity adjustment by way of speed on IP assemblies with snubber valve is only possible with negative torque control.

For this reason the RDV is always found in conjunction with a K-governor or RE EDC positioner.

#### Advantages of snubber valve:

- \* Higher line pressures on nozzle end
- \* Shorter injection time
- \* Faster pressure dissipation at nozzle (rapid spill)

## GENERAL RDV VERSION

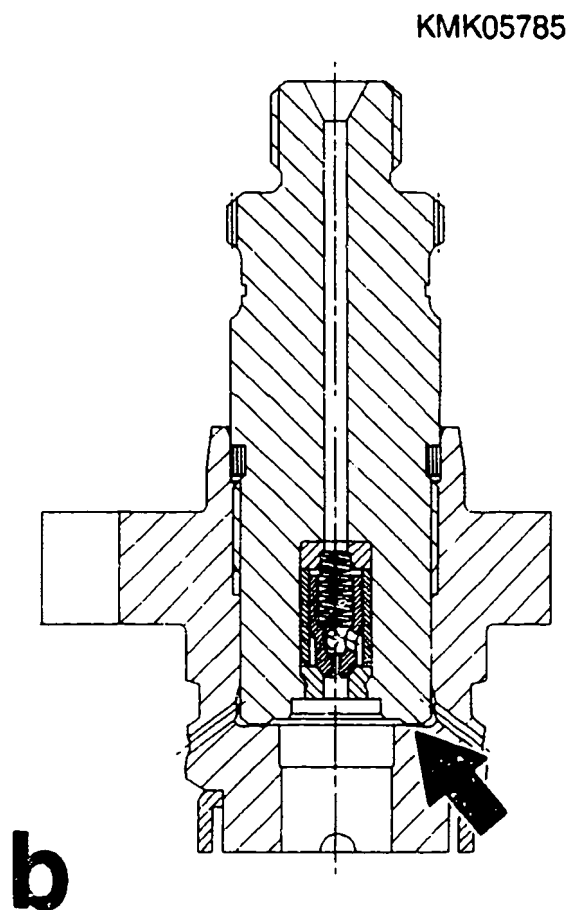
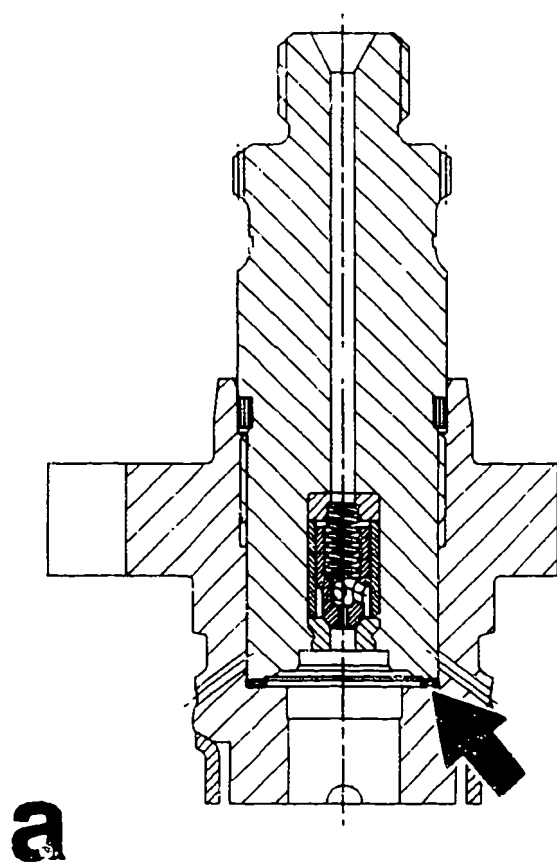
Two different seal versions (RDV unit/plunger-and-barrel assembly) are installed as standard;

**Fig. a: Seal with gasket.**

The illustration shows an RDV for P-7100 pumps. Delivery-valve holder with no gripping edge.

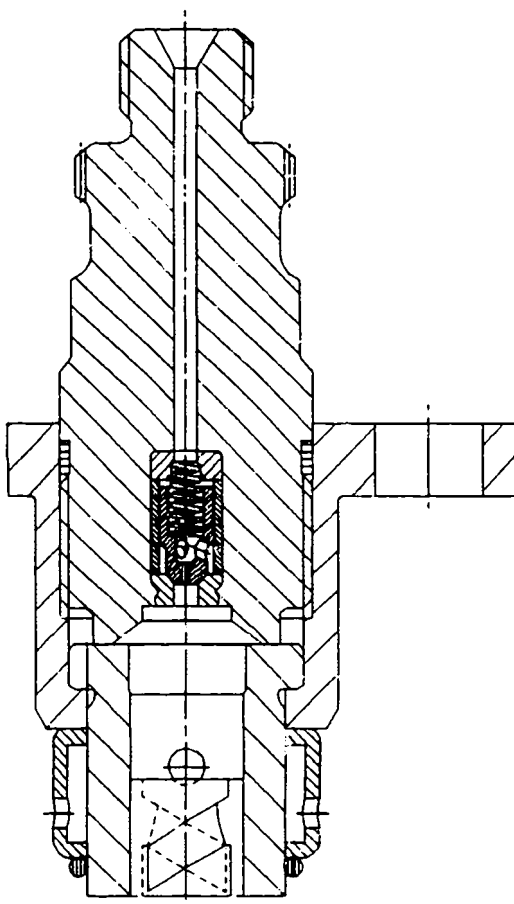
**Fig. b: Hard seal  
(no gasket).**

Installed in following pumps:  
P-8000, F-8500, R and H-pumps.  
Delivery-valve holder with gripping edge.



## RDV VERSION FOR PUMP SIZE P-3000

On in-line pumps of size P-3000 with RDV exclusive use is made of the "hard seal" (no gasket). The delivery-valve holder forms a direct seal with the plunger-and-barrel assembly.



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IN-LINE PUMPS PE (S) ..

Workshop: EP

03.1995

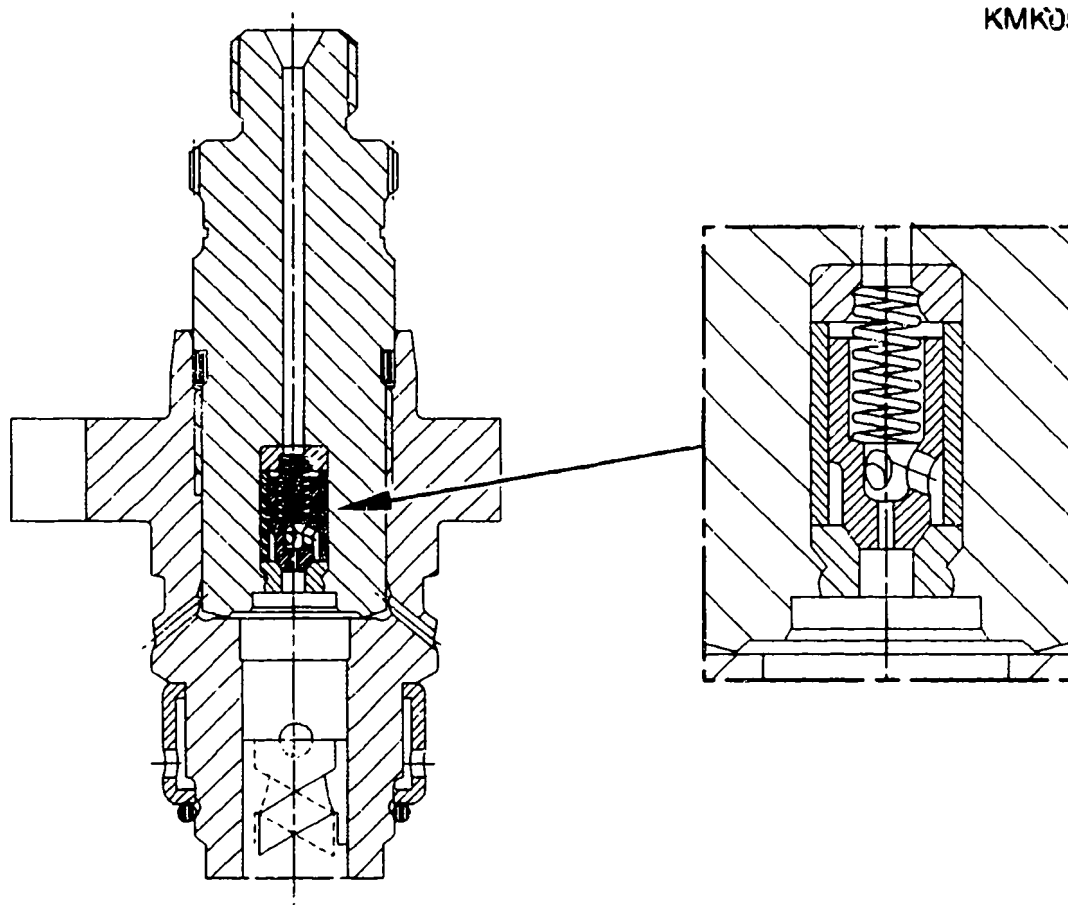
SI 0469 En

Snubber valve (RDV)

Installation instructions and fault  
recognition

With certain new adjustments to  
in-line pumps of sizes P, R and H use  
is made of the newly developed snubber  
valve (RDV) (fig. - section).

This measure makes it possible to  
dispense with the delivery valve used  
to date.

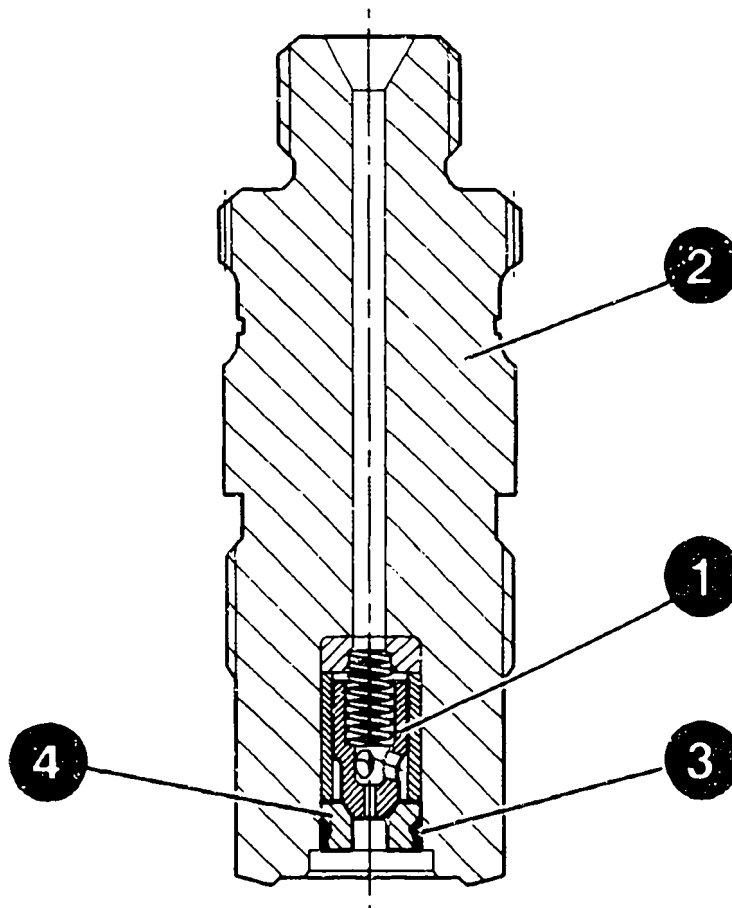


KMK05782

The snubber valve is permanently riveted to the delivery-valve holder. Valve and delivery-valve holder form a unit.

The two components are thus referred to in this Service Info as "RDV unit" (fig.).

- 1 = Snubber valve
- 2 = Delivery-valve holder
- 3 = Riveted joint
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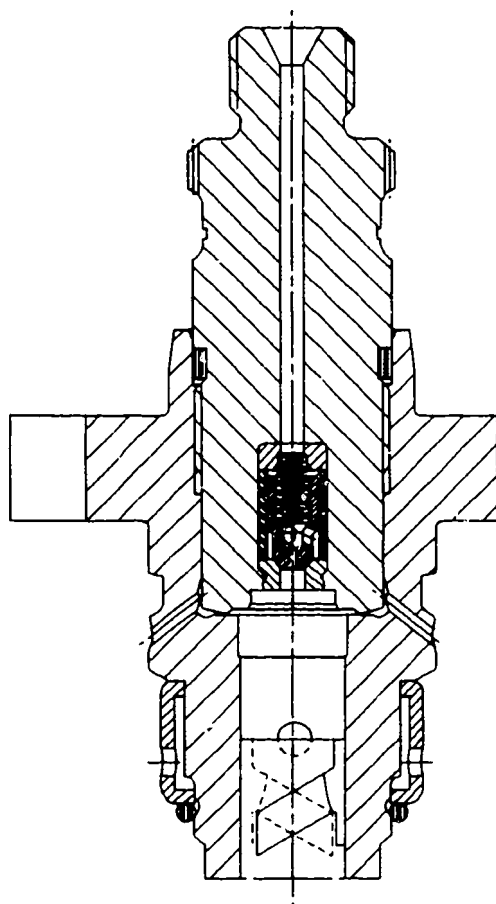


KMK05783

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KMK05784



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For this reason the RDV is always found in conjunction with a K-governor or RE EDC positioner.

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- \* Shorter injection time**
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## GENERAL RDV VERSION

Two different seal versions (RDV unit/plunger-and-barrel assembly) are installed as standard:

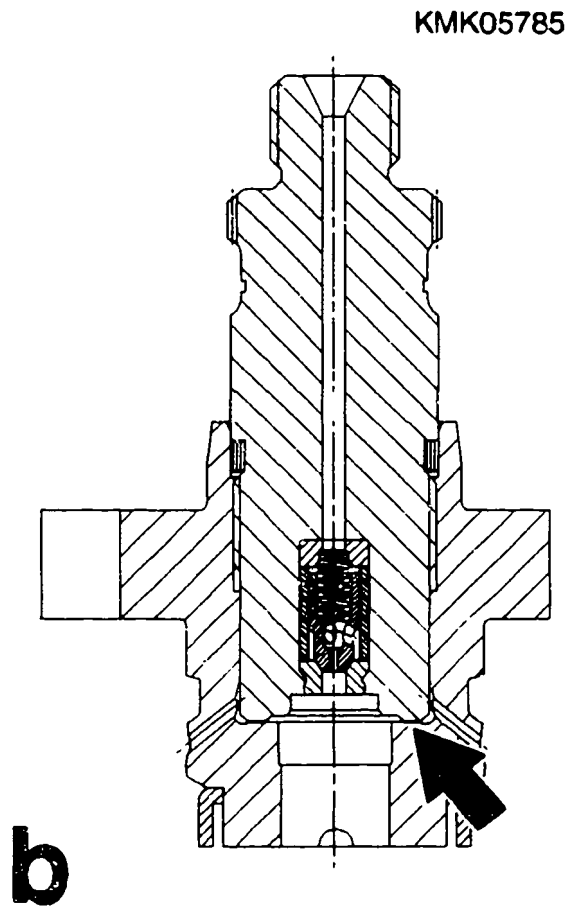
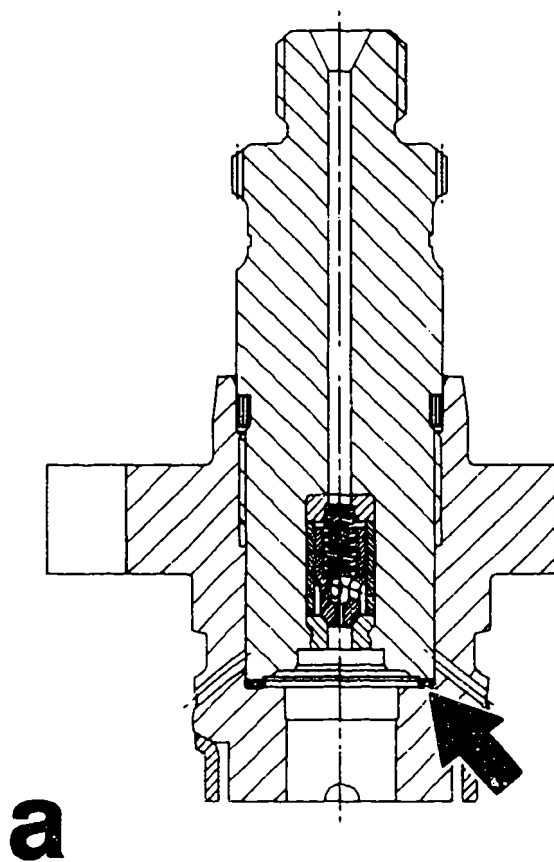
**Fig. a: Seal with gasket.**

The illustration shows an RDV for P-7100 pumps. Delivery-valve holder with no gripping edge.

**Fig. b: Hard seal**

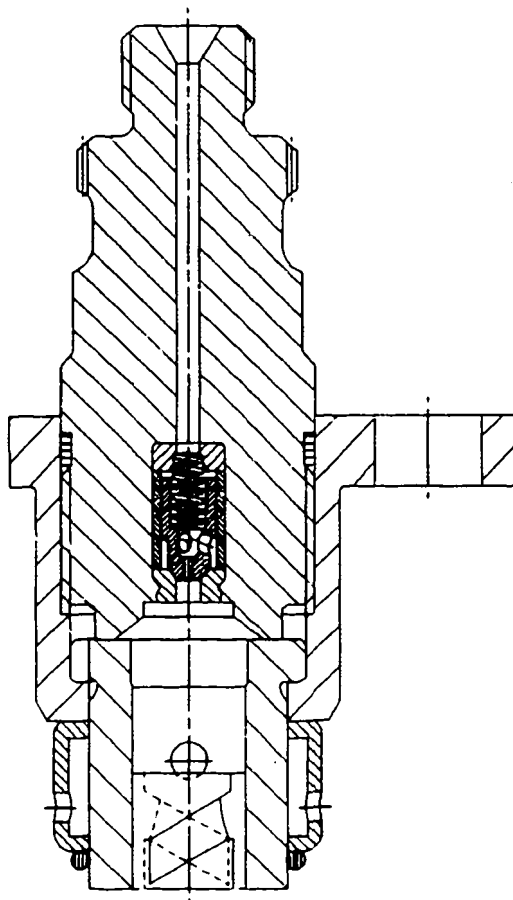
(no gasket).

Installed in following pumps:  
P-8000, P-8500, R and H-pumps.  
Delivery-valve holder with gripping edge.



## RDV VERSION FOR PUMP SIZE P-3000

On in-line pumps of size P-3000 with RDV exclusive use is made of the "hard seal" (no gasket). The delivery-valve holder forms a direct seal with the plunger-and-barrel assembly.



KMK05786

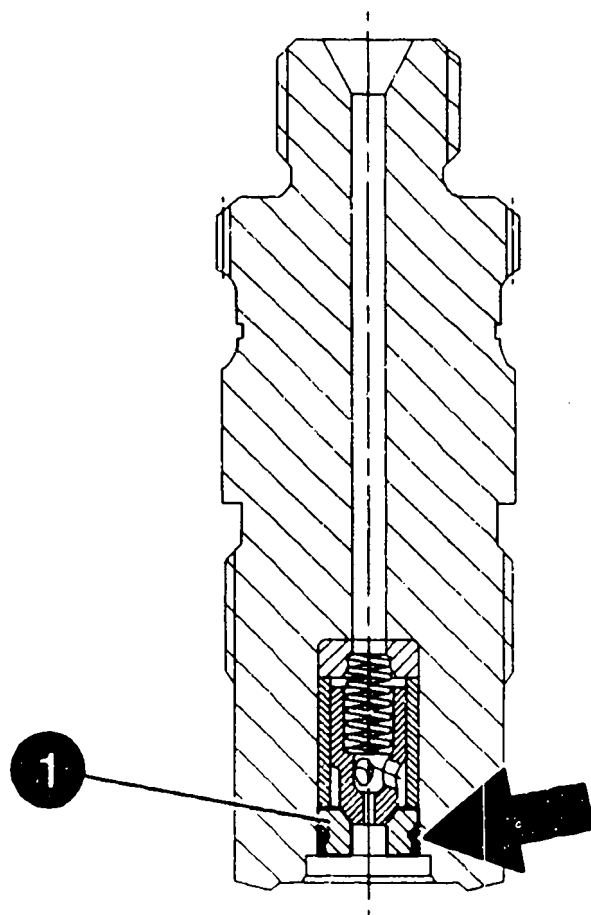
Trouble-shooting is to be performed if major fluctuations in quantity (above all at idle) are established with the injection pump on a test bench, however the plunger-and-barrel assemblies and calibrating nozzle holder assemblies are in proper hydraulic working order.

Screw out RDV unit if quantity scatter outside tolerance is found at a barrel.

Check riveted joint (fig. - arrow).

Poor riveting can be seen from loose internals, i.e. it should not be possible to move the valve seat (fig. - item 1) if the riveted joint is OK.

Scrap RDV unit with loose internals and replace with a new one.



KMK05787

If riveting is not found to be faulty, replace RDV unit with that of a barrel which is OK.

If the fault is still present, the RDV unit is defective and is to be replaced with a new one.

If the fault is no longer present, the RDV unit is NOT defective.

**Note:**

With RDV versions featuring a gasket use must be made of a new gasket even after the RDV assembly has been loosened once.

**Note:**

- \* It is NOT possible to repair an RDV. Defective RDV units therefore have to be scrapped.
- \* Tightening torques remain valid as for delivery-valve holder with delivery valve.

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HOLE-TYPE NOZZLES  
SIZE "P"  
MODIFICATION TO NOZZLE  
INLET PORT

Workshop: EP  
03.1995  
SI 0473 En

New intermediate plate

Alteration of the nozzle inlet port has led to the introduction of a modified intermediate plate on all P-nozzles for nozzle-holder assemblies with 17 mm diameter.

**Modifications:**

- \* Angled inlet port
- \* Nozzle without countersink

**Advantages:**

- \* No burr formation
- \* More reliable production
- \* No additional throttle effect

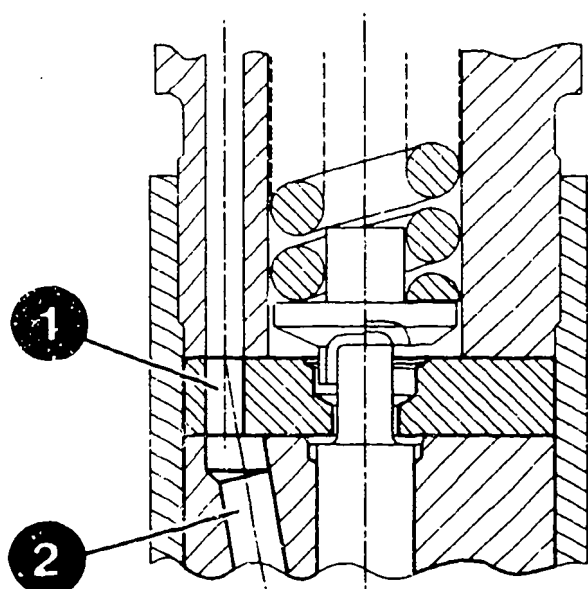


Old version (fig. a)

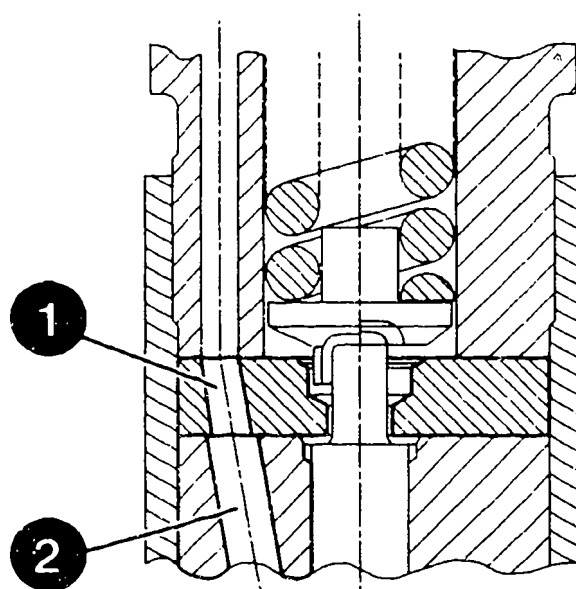
- 1 = Intermediate plate with straight inlet port
- 2 = Countersunk inlet port (nozzle)

New version (fig. b)

- 1 = Intermediate plate with angled inlet port
- 2 = No inlet-port countersink (nozzle)



a



b

KMK05847

Observe the following when performing repairs:

- \* Always fit new intermediate plate on nozzle replacement.
- \* Countersunk nozzles can be combined with new intermediate plate (mixed installation).
- \* Nozzles with no countersink are never to be fitted with old intermediate plate (throttle effect).

- \* With all nozzle-holder assemblies (diameter 17 mm) make sure that intermediate plate is properly aligned on installation.
- \* If intermediate plate is not aligned, opening-pressure adjustment is not possible in the case of continuous positioning pins.

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USE OF "ALTERNATIVE  
FUEL" WITH  
INJECTION COMPONENTS

Workshop: EP  
03.1995  
SI 0478 En

Use of rapeseed oil methyl ester (RME)

"Alternative fuels" are all special  
fuels which do not correspond to  
standard diesel fuel.

Examples of special fuels:

- \* Vegetable ester, e.g. rapeseed oil  
methyl ester (RME)
- \* Vegetable/animal oils and fats,  
e.g. rapeseed oil
- \* Fuels based on mineral oil,  
e.g. kerosene
- \* Alcohols (methanol und ethanol)

Fuel suitability is governed by the following criteria:

- \* Lubricity
- \* Viscosity
- \* Boiling point, density
- \* Material compatibility
- \* Ageing and formation of deposits

The advantages of fuel made from rapeseed oil are to be found in fewer emissions and less sulphur.

## FUEL REQUIREMENTS

RME fuel must correspond to the draft Standard DIN V 51606 or ÖNORM C1190.

The fuel grade may vary within the European Union (EU) as there is still no common Standard.

A long injection-system service life is only guaranteed within the scope of the draft Standard.

## APPLICATIONS

RME is suitable for use in motor vehicles with diesel engines for which the engine manufacturers have released this type of fuel either in its pure form or mixed with diesel fuel as per DIN EN 590.

## INFORMATION ON RME-OPERATION WITH DIESEL FUEL-INJECTION EQUIPMENT

### \* VE..F PUMP

Without conversion, mechanical VE pumps can be used with max. 10 % RME (Diesel-RME mixture).

Operation with 100 % RME is permitted following conversion of the timing-device seals and radial-lip-type oil seal made of Viton.

\* VA PUMP

VA pumps are not to be converted.  
Reason: Sticking of the control  
spool can influence the starting  
fuel delivery shutoff.

\* VE..E

Conversion to RME fuel or RME mix is  
not possible for engines with  
electronic diesel injection (EDC)  
with control-collar travel sensor  
(potentiometer).

As regards EDC-VE pumps with  
half-differential inductive pickup  
there are no critical aspects  
vis-a-vis RME with the exception of  
the ring magnet in the inlet port to  
the injected-quantity adjuster.

## CONVERSION KIT FOR VE PUMPS

The following parts are required  
for converting VE pumps:

\* VE..F

- Timing-device seals (spring  
and delivery end)

Part no. 1 460 210 304

Code color - green

- Radial-lip-type oil seal

Shaft diameter 17 mm

Part no. 1 460 283 312

Shaft diameter 20 mm

Part no. 2 460 283 001

Color code - brown

\* VE..E with half-differential inductive pickup

- Radial-lip-type oil seal
- Timing-device seals
- and modified ring magnet (installed in inlet port to injected-quantity adjuster).

The conversion kit will probably be available as of mid 1995.

\* IN-LINE PUMPS  
(mech. and electronic governors)

- Operation with addition of max. 10 % RME to diesel fuel is generally possible.

Operation with 100 % RME is permitted provided allowance is made for the "general notes", fuel requirements and conversion of the assembly O-rings to Viton.

- Prior to lengthy periods of non-use the injection equipment is to be flushed with diesel fuel.



## **\* NOZZLE-HOLDER ASSEMBLIES**

Nozzle-and-holder assemblies (DHK) with no needle-motion sensor (NBF) can be used without the need for special measures.

Field testing of RME compatibility has still to be completed for DHK with NBF.

## **\* DIESEL ANTI-THEFT SAFEGUARD (DDS)**

The core seals of the connecting cables are made of silicone and are resistant to RME.

## **\* Fuel filter**

Conversion of seal to Viton following agreement with individual vehicle manufacturers.

## **\* Supply pump**

The supply-pump seals for RME operation are "green".

### General notes

- \* The RME-resistance of other parts of the fuel system must be guaranteed by the vehicle manufacturer.
- \* Warranty claims regarding sticking of functional elements such as control rod are exempt from warranty coverage.

### General notes

- RME subjects the injection pump to greater pressure loading as it has a higher viscosity than diesel fuel. Necessary measures such as alteration to the injected quantity in the case of overload are to be clarified with the vehicle manufacturer.
- Generally speaking a power loss of 5 % must be expected when using RME.

The following assemblies/sizes have been released for RME operation/are gradually being converted to Viton.

\* M-pump assemblies

0 400 064 500

0 400 074 779

0 400 074 880

0 400 074 881

\* P-pumps as of A-modification

\* MW-pumps as of 10 mm stroke

Use new assembly O-rings with all pump repairs.

In addition to conversion work on the injection pump there is a need for vehicle modifications.

The first customer to make standard use of the following fuel-system components made of RME-resistant material (as of chassis no. 1HRp 491791) is VW.

Enquiries are to be made regarding necessary alterations on vehicles from other manufacturers.

**\* RME-RESISTANT COMPONENTS**  
**(e.g. VW Golf Model 94)**

- Fuel tank
- Fuel sensor
- Fuel lines (inlet and return)
- Leakage-fuel hoses between injection nozzles including return line to fuel filter
- Fuel filter and hose connections to fuel supply and return pipe
- Fuel line from filter to injection pump
- Fuel line from tank to engine compartment

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**IN-LINE AND DISTRIBUTOR-  
TYPE PUMPS**

**Workshop: EP  
03.1995  
SI 0479 En**

**Swollen LDA diaphragms with  
diesel fuel-injection pumps**

**If faults occur as a result of swollen  
LDA diaphragms, this is due to  
incorrect handling on assembly.  
Diaphragms damaged in this manner must  
be replaced.**

**Please note that on assembly LDA  
diaphragms are never to be moistened  
with gasoline, diesel fuel or  
calibrating oil.**

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**NOZZLE-AND-HOLDER  
ASSEMBLIES**  
Notes on testing and  
adjustment of nozzle  
opening pressure

Workshop: EP  
03.1995  
SI 0480 En

Different adjustment methods used  
by manufacturer and service personnel  
often lead to doubt about the opening-  
pressure setting.  
Manufacturer/service pressure settings  
are described in the following.

**GENERAL**

There are 2 ways of determining the  
set opening pressure:

**\* Method 1 (IDI engines)**

The set opening pressure corresponds  
to data on nozzle-holder assembly.

Example: set                   130 +8 bar  
                  stamped on   130     bar

**\* Method 2 (DI engines)**

The set opening pressure is higher  
than the opening pressure stamped on  
the nozzle-holder assembly.

Example: set                   210 +8 bar  
                  stamped on   200     bar

The advantage of the higher pressure setting with method "2" (exceeding of load limit) is the longer running time above the opening-pressure limit.

The higher opening-pressure setting initially causes rougher engine running but this soon becomes normal.

The maximum extent to which the opening pressure may be exceeded is stipulated by the engine manufacturer.

## CHECKING OPENING PRESSURE

### \* Manufacturer

Basis is setting tolerance + 7 bar  
(check tolerance + 8 bar)

All nozzle-and-holder assemblies must be within this tolerance after setting.

**\* Checking of new, non-used nozzle-holder assemblies**

Nozzle-and-holder assemblies (DHK) which have not been used on an engine are governed by the setting tolerance + 7 bar.

On account of the possible drop in pressure, used DHK are governed by an opening pressure which may be below the rated value.

After max. 20 minutes operation a pressure difference of 3 bar must be expected, i.e. the stamped-on opening pressure is already undershot.

**\* Checking of used DHK**

In the event of pressure drop during operation neither the set nor the stamped-on value is binding.

The following empirical values - referenced to rated value - apply to possible pressure drop (pressure difference):

\* for pass. vehicles after 50 000 km  
IDI engines max. 13 %  
DI engines max. 15 %

\* for comm. vehicles after 150 000 km  
DI engines max. 20%



**\* Service setting of opening pressure**

For service applications, nozzle-and-holder assemblies are set to the stamped-on value with the prescribed tolerance.

If no value is stamped on, the opening pressure to be set is to be taken from the engine manufacturer's documentation.

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Conversion kit for reducing aerosol-vapor mixture with Diesel injection-pump test benches.

**Problem:**

In the case of injection-pump test benches with graduate holders, the amount of oil squirted from the calibrating nozzles is recorded in graduates. A separator is actuated on reaching the specified number of strokes. The calibrating oil then no longer runs into the graduates but rather by way of the separator into the inside of the graduate holder.

The high temperature of the fuel and the large surfaces in the graduate holder may result in evaporation of part of the fuel. On injection-pump test benches with continuous quantity measurement (KMM) the calibrating-oil vapor escapes at the system mount in the areas between the calibrating-nozzle holders and reduction sleeves.

**Remedial measures:**

Following installation of a conversion kit in the graduate holder, the calibrating oil is collected - when measurement is not taking place - in a closed discharge trough.

The calibrating oil is routed from the trough via hoses in a closed circuit back into the tank.

At the KMM system mount the sight glasses and reduction sleeves are replaced by damping units. Connection to the calibrating-nozzle holders is made by way of quick-release connections.

The above-mentioned conversion measures considerably improve working conditions during injection-pump testing.

The following applies to test benches with graduate holder:

Conversion kit: 1 687 001 332

For test benches: EFEP 615 and all  
S \*

EFEP 615A and all S  
EPS 711 and all S

With graduate holder: 1 688 130 138  
1 688 130 169  
1 688 130 154

The measuring device is adjustable.  
Max. 12 measurement points are possible.  
(\* S= Special version)

Conversion kit: 1 687 001 349

For test benches: EFEP 515 and all S  
EPS 707 and all S

With graduate holder: 1 688 130 145

The measuring device is not adjustable.  
Max. 12 measurement points are possible.

Conversion kit: 1 687 001 350

For test benches: EFEP 500  
EFEP 500 A S1 - S18  
EFEP 500 A S38 + S40  
EPS 704 S1 - S12  
EPS 704 S60 + S61  
EPS 270

With graduate holder: 1 688 130 128  
1 688 130 149

The measuring device is not adjustable.  
Max. 8 measurement points are possible.

Conversion kit: 1 687 001 351

For test benches: EFEP 500 A S19 - S37  
EPS 704 S18 - S30

With graduate holder: 1 688 130 151

The measuring device is adjustable.  
Max. 12 measurement points are  
possible.

The following applies to test benches  
with continuous quantity measurement  
system (KMM):

Conversion kit: 1 687 001 294

Use is made of a standard conversion  
kit for all system mounts. One kit is  
required for each measurement point.

The spray dampers have to be removed  
at the individual calibrating-nozzle  
holders and replaced by connecting  
nipples. One parts set consists of  
four connecting nipples with  
sealing rings.

Parts set for connecting thread M20x1.5  
1 687 010 089  
(for conversion of additional calibrat-  
ing-nozzle holder assemblies)

For connecting thread M22 x 1  
1 687 010 088  
(for conversion of calibrating-nozzle  
holders with T-nozzles)

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DISTRIBUTOR-TYPE  
PUMPS VE..F..

Workshop: EP  
06.1995  
SI 0486 En

Modification to cam roller ring  
Service parts assembly

To date, the "cam roller ring" service parts assembly has only been quoted as a complete item in service parts lists and installed as an entity. Technology has now reached a level where it is possible to replace individual rollers, bushings and bearing pins.

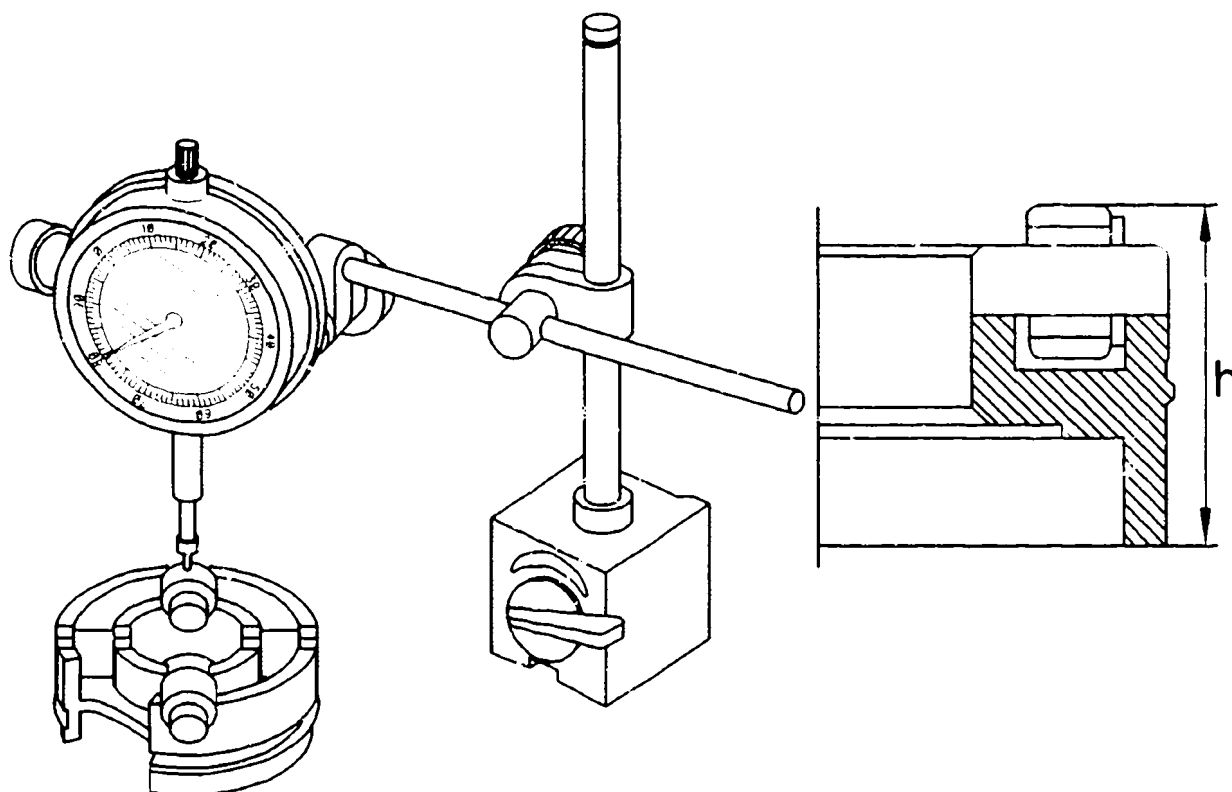
Attention is to be paid to the following when installing the individual components.

- \* To avoid damage caused by dry starting, rollers, bushings and bearing pins are to be moistened with calibrating oil prior to installation.

Measure roller height in cam roller ring prior to installation.

\* Maximum difference between individual roller heights 0.04 mm

KMK03383



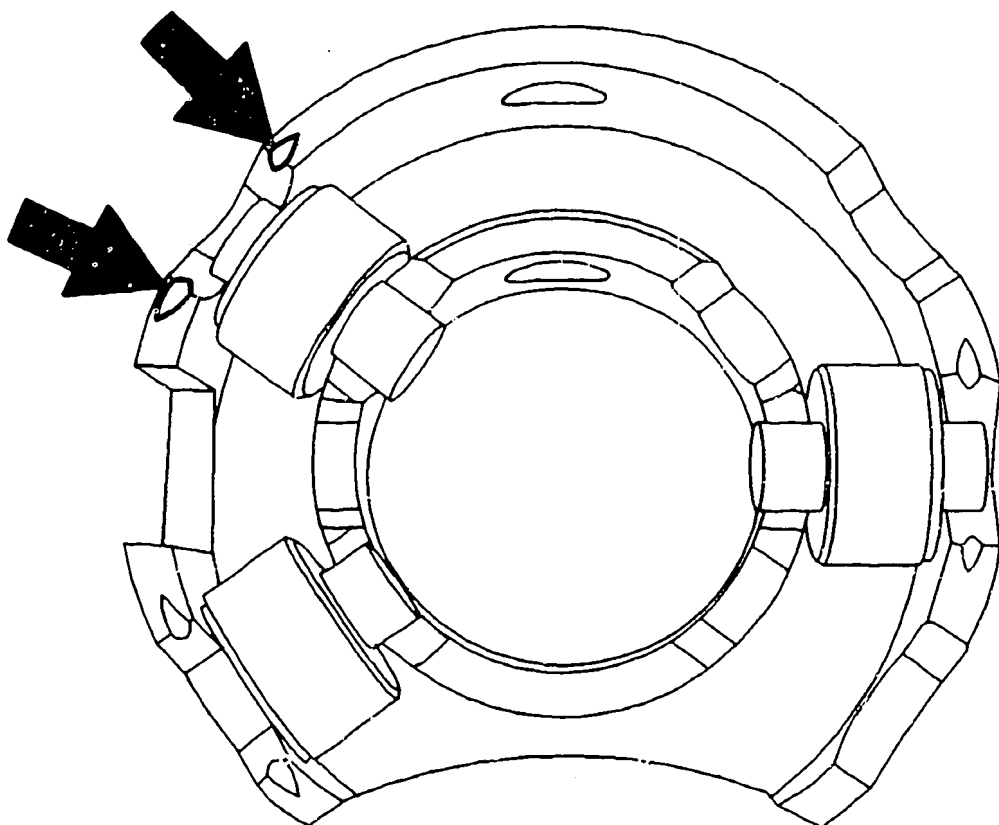


## \* Installation position of rollers

Attention has to be paid to the installation position of the rollers in the case of cam roller rings with 3 rollers.

Bearing grooves into which one roller is to be inserted in each case, are marked by notches (arrows) on the end face of the cam roller ring.

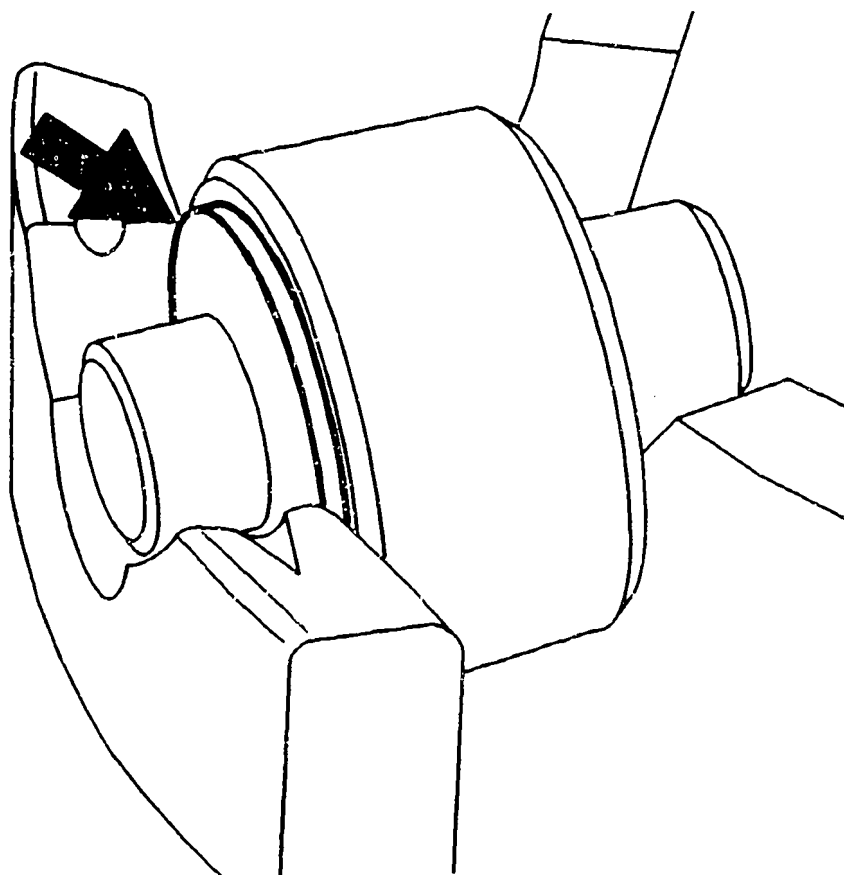
KMK03384



When installing the rollers, make sure that the spring seats are installed on the outside of the rollers.

The tapered side must be facing the outer ring.

Install cam roller ring in line with repair instructions (see W-400/0..).



KMK03385

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DISTRIBUTOR-TYPE  
FUEL-INJECTION PUMP  
VE..F..

Workshop: EP  
06.1995  
SI 0488 En

Failure of roller ring - cold start  
acceleration device (KSB) controlled  
by electr. thermocouple.

Applies to all distributor-type fuel-  
injection pumps as of date of manu-  
facture (FD) 370 where tie rod has  
cracked or setting shaft broken.

In the event of such failure, renew  
damaged parts and thermocouple fitted.

Damaged parts, such as tie rod/setting  
shaft with thermocouple will be spec-  
ifically requested by K5/QSG via KH.

Damaged parts are to be kept for 8  
weeks.

At the end of this period the parts  
are to be scrapped.

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VE (DI)  
FUEL-INJECTION PUMPS

Workshop: EP  
06.1995  
SI 0489 En

Alteration to setting of cold  
start acceleration device (KSB)

Injection pumps affected

0 460 414 104 VE..R535  
0 460 414 105 VE..R542

To improve cold starting problems, the  
adjustment travel of the cold start  
acceleration device acting on the  
roller ring is being altered from  
7 mm to 2.9 mm.

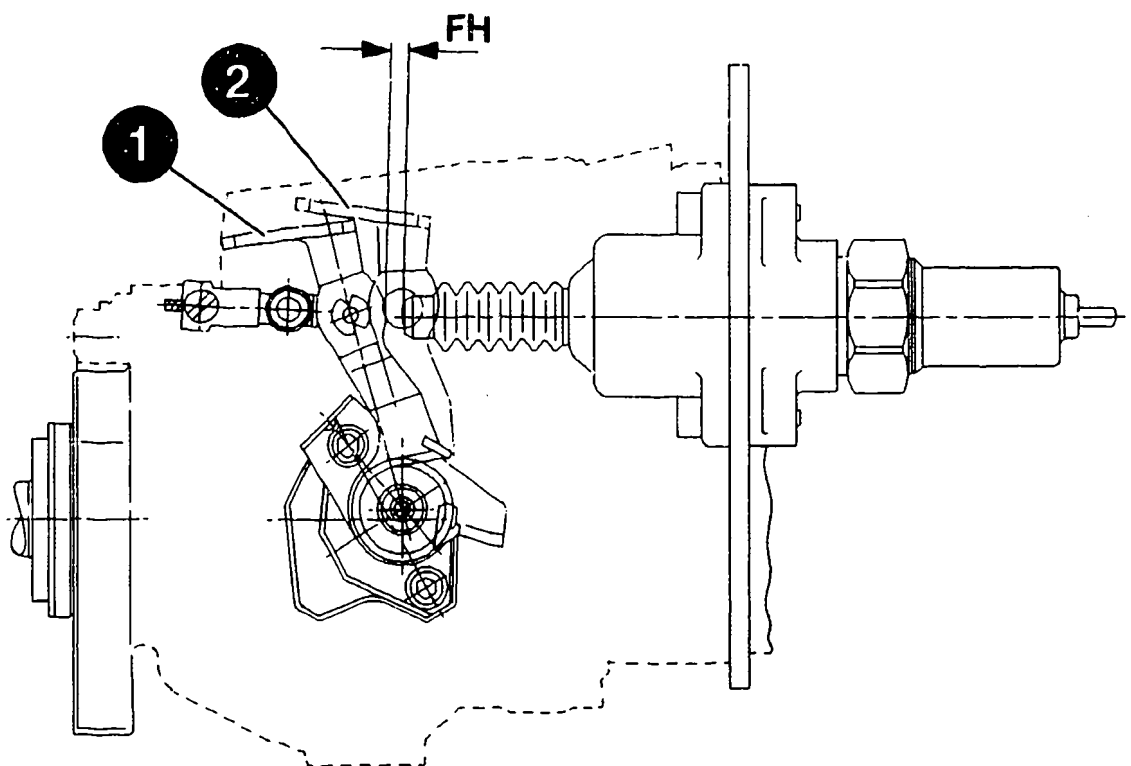
Note:

In future, the adjustment travel  
for VE pumps with KSB will be given  
in the KD test specification sheet  
under "Functional stroke" (FH).

1 = Position, engine warm

2 = Position, engine cold

FH= Adjustment travel KSB  
(functional stroke)



KMK05983

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FUEL SUPPLY PUMPS  
FP/K..24..

Workshop: EP  
06.1995  
ST 0493 En

## Repair instructions

On fuel supply pumps of  
series FP/K..24..

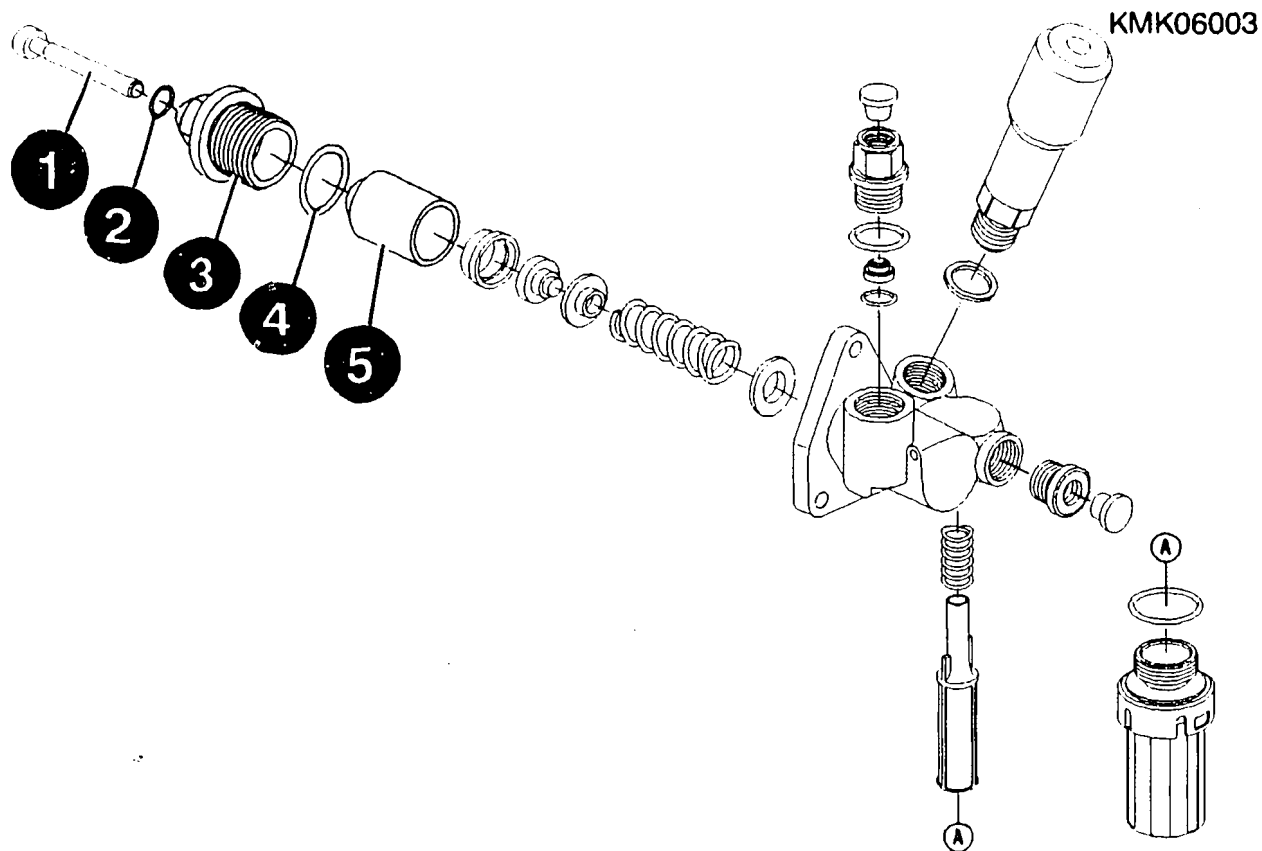
the seal between the roller-tappet  
shell and the pump housing is  
produced at the factory with an  
edge grip.

Following repair an O-ring (fig. -  
item 4) must be fitted on reassembling  
the roller-tappet shell.

|                                               |               |
|-----------------------------------------------|---------------|
| O-ring part no.:                              | 2 440 210 012 |
| Tightening torque for<br>roller-tappet shell: | 45 +5 Nm      |

Without an O-ring fuel can ingress  
into the pump and dilute the  
lubricating oil.

- 1 = Sliding tappet
- 2 = O-ring
- 3 = Roller-tappet shell
- 4 = O-ring
- 5 = Pump plunger



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USE OF FLEET GUARD  
FUEL FILTERS FOR  
BOSCH-EQUIPPED  
CUMMINS DIESEL ENGINES

Workshop: EP  
06.1995  
SI 0494 En

In the light of recent events we should like to point out that warranty claims for Bosch fuel-injection pumps cannot be rejected simply on the grounds of a Fleet Guard filter having been used.

Particularly in instances where Bosch fuel injection pumps have failed as a result of considerable wear after a short operating period, a check is first to be made for example on the fuel grade.

Warranty is not to be rejected simply on the basis of a Fleet Guard filter having been used.

The standard workshop procedure for Diesel fuel injection system diagnosis (such as is also used for other fuel filters) remains unaffected.

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EDC IN-LINE PUMPS  
PE(S)..H.., PE(S)..P..

Workshop: EP  
06.1995  
ST 0495 En

## INSTRUCTIONS ON ASSEMBLY, TESTING AND ADJUSTMENT

The test and adjustment instructions for H-pumps (PE(S)..H..), microcard VDT-W 400/054, have been revised and redistributed with date of issue 03.95.

These instructions have been extended to include a section on disassembly and assembly of manufacturer-specific drive flanges (MAN, Mercedes-Benz, Scania) and on the special procedure for start-of-delivery marking (Mercedes-Benz) and start-of-delivery blocking (Scania).

The new tools additionally required have been incorporated into the tools list:

|                       |               |
|-----------------------|---------------|
| Holder                | 0 986 612 694 |
| Setting pin (Scania)  | 0 986 612 697 |
| Adapter lead (Scania) | 0 986 610 114 |

Please note the following:

- \* The section on disassembly/assembly of drive flanges also applies to repairs in line with instructions W-400/052 (H-pump) and W-400/053 (positioners) as well as to P-pumps with the same drive technique.
- \* The procedure for start-of-delivery blocking on Scania pumps also applies to all Scania flange pumps of size P with RE positioner and mechanical governor.
- \* In addition to the H-pump, the Scania-specific adapter lead 0 986 610 114 is also needed for all Scania EDC P-pumps as of the start of 1995.

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|                    |                    |
|--------------------|--------------------|
| USE OF FLEET GUARD | Motor vehicle: NKW |
| FUEL FILTERS FOR   | Workshop : EP      |
| BOSCH-EQUIPPED     | 12.1995            |
| DIESEL ENGINES     | ST 0503 En         |

In the light of recent events we should like to point out that warranty claims for Bosch fuel-injection pumps cannot be rejected simply on the grounds of a Fleet Guard filter having been used.

Particularly in instances where Bosch fuel injection pumps have failed as a result of considerable wear after a short operating period, a check is first to be made for example on the fuel grade.

Warranty is not to be rejected simply on the basis of a Fleet Guard filter having been used.

The standard workshop procedure for Diesel fuel injection system diagnosis (such as is also used for other fuel filters) remains unaffected.



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DIESEL  
FUEL-INJECTION PUMPS

Motor vehicle: FZD  
Workshop: EP  
12.1995  
ST 0507 En

Diesel fuel with lower  
sulphur content

As of October 1995 only diesel fuel  
with < 0.05 percent sulphur will be  
available throughout Germany and  
Austria.

As of 1.10.1996 this will likewise  
apply to the entire European Union.

This low-sulphur fuel will reduce  
emissions of sulphate particles and  
harmful sulphur dioxide. The sulphur  
in the crude oil is removed by way  
of hydrogen treatment.

The intensity of this hydrogen treat-  
ment also governs the extent to which  
lubricating components are removed  
from the diesel fuel.

This may result in damage and  
increased wear at the injection pump.

Vehicle performance may be affected as follows:

- \* Rough engine running at idle and part load
- \* Lack of power
- \* Increased fuel consumption
- \* Increased pollutant emissions

Fuel-lubricated distributor-type injection pumps are particularly reliant on good diesel fuel lubricity. Damage may however also occur with in-line pumps if the fuel is subjected to considerable hydrogen treatment.

To guarantee the lubricity of the 0.05 percent sulphur diesel fuel the major oil companies provide the fuel with effective lubrication additives in a sufficient concentration. Fuels containing such effective additives regain their F U L L lubricity.

Caution is to be exercised with diesel fuels S U B S T A N T I A L L Y reduced in price.

To ensure a long service life and proper functioning of fuel-injection systems, we recommend that use always be made of diesel fuel containing lubricant additives. Customers are not allowed to mix in additives themselves.

Bosch cannot accept warranty for injection-pump damage obviously resulting from fuel with poor lubrication properties.

At present only the K5 development departments can definitively assess injection pumps.

K5/EVR4 for distributor types  
and

K5/ERR for in-line types

Problematic injection pumps are to be sent to the appropriate department at the following address.

ROBERT BOSCH GmbH

FeW / LOG 3 - Auspackraum  
z.W. an K5 / \*  
Am Boschwerk

70469 Stuttgart

Germany

\* = Please enter appropriate department  
designation (EVR or ERR)

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FUEL-INJECTION PUMPS  
PFE AND PFM  
IN KHD ENGINES

Workshop: EP  
12.1995  
SI 0508 En

Service procedure

Bosch has developed/further developed various types of PF pump. This involved measures which simplified the design of the pump with the result that PF pump repair is no longer necessary.

Special repair tools and accessories for testing and adjustment on a pump test bench have thus not been stipulated.

If such an injection pump fails, it is to be replaced with a new one. The usual Bosch warranty periods apply. Once the warranty has expired, the costs of replacing such pumps are to be billed to the customer.

This initially affects the following  
PF pumps:

Pump: 0 414 287 002  
Designat.: PFE 1 A 80 S 3001

Pump: 0 414 287 004  
Designat.: PFE 1 A 80 S 3003

Pump: 0 414 287 005  
Designat.: PFE 1 A 80 S 3004

Pump: 0 414 287 007  
Designat.: PFE 1 A 80 S 3006

Pump: 0 414 287 008  
Designat.: PFE 1 A 80 S 3008

Pump: 0 414 287 010  
Designat.: PFE 1 A 80 S 3009

Pump: 0 414 287 011  
Designat.: PFE 1 A 80 S 3010

Pump: 0 414 401 101  
Designat.: PFM 1 P 100 S 2001  
(Monoblock)

Pump: 0 414 401 102  
Designat.: PFM 1 P 100 S 2002  
(Monoblock)

Pump: 0 414 401 103  
Designat.: PFM 1 P 100 S 2003  
(Monoblock)

Pump: 0 414 491 101  
Designat.: PFM 1 P 90 S 1001  
(Monoblock)

Pump: 0 414 491 102  
Designat.: PFM 1 P 90 S 1002  
(Monoblock)

Pump: 0 414 491 103  
Designat.: PFM 1 P 90 S 1003  
(Monoblock)

Pump: 0 414 491 104  
Designat.: PFM 1 P 90 S 1004  
(Monoblock)

Pump: 0 414 491 105  
Designat.: PFM 1 P 90 S 1005  
(Monoblock)

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FORD NEW HOLLAND  
(FNH) TRACTORS  
WITH RSV GOVERNORS

Motor vehicle: NKW  
Workshop: EP  
02.1996  
ST 0509 En

### Unstable idling

If unstable idling is encountered with Ford New Holland tractors (FNH), the problem can be eliminated by converting the RSV governors.

This affects the following injection pump/governor assemblies up to date of manufacture (FD) 564:

- \* 0 400 876 405 and ..406
- \* 0 402 076 750 and ..751

### REMEDIAL MEASURES

Assembly:

0 400 876 405

Governor:

Designation: RSV 400...1050 A2C2263-1L

Part no.: 0 420 232 584

In future:

Designation: RSV 400...1050 A0C2263-8L

Part no.: 0 420 232 615

Components:

- |                      |               |
|----------------------|---------------|
| * Flyweight assembly | 1 428 194 028 |
| * Spring retainer    | 1 420 506 680 |
| * Extension spring   | 2 424 650 008 |

## REMEDIAL MEASURES

Assembly:

0 400 876 406

Governor:

Designation: RSV 400...1050 A2C2263-2L

Part no.: 0 420 232 585

In future:

Designation: RSV 400...1050 A0C2263-9L

Part no.: 0 420 232 616

Components:

|                      |   |     |     |     |
|----------------------|---|-----|-----|-----|
| * Flyweight assembly | 1 | 428 | 194 | 028 |
| * Spring retainer    | 1 | 420 | 506 | 563 |
| * Extension spring   | 2 | 424 | 650 | 008 |

## REMEDIAL MEASURES

Assembly:

0 402 076 750

Governor:

Designation: RSV 400...1050 P2A557

Part no.: 0 421 833 394

In future:

Designation: RSV 400...1050 P0A602

Part no.: 0 421 833 483

Components:

|                      |   |     |     |     |
|----------------------|---|-----|-----|-----|
| * Flyweight assembly | 9 | 428 | 270 | 023 |
| * Spring retainer    | 1 | 420 | 506 | 567 |
| * Fork lever         | 9 | 420 | 270 | 011 |
| * Extension spring   | 2 | 424 | 650 | 008 |

## REMEDIAL MEASURES

Assembly:

0 402 076 751

Governor:

Designation: RSV 400...1050 P2A557-1

Part no.: 0 421 833 396

In future:

Designation: RSV 400...1050 POA603

Part no.: 0 421 833 484

### Components:

|                      |               |
|----------------------|---------------|
| * Flyweight assembly | 9 428 270 023 |
| * Spring retainer    | 1 420 506 689 |
| * Fork lever         | 9 420 270 011 |
| * Extension spring   | 2 424 650 008 |

After conversion, the governor is to be re-marked accordingly.

The converted injection pump/governor assembly is to be adjusted in line with the valid test specification sheet.

The costs of replacement parts are to be indicated on the warranty claim with fault number 40 and the text

"Flyweight alteration".

The costs of conversion are to be billed to the customer.

Measure is limited to  
December 1996.

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## NOZZLES

Workshop: EP  
12.1995

Ultrasonic Cleaning prior  
to Nozzle Testing

ST 0510 En

In view of recent experience from the service field, we should like to refer to various service information bulletins regarding testing of Bosch nozzles and nozzle-holder assemblies (nha). We emphasize once again that prior to testing nozzles and/or nha, the parts have to undergo through ultrasonic cleaning (see special service instructions).

Please also note that the nozzle must **n e v e r** be cleaned with a steel wire brush since this will destroy the geometry of the nozzle, thus reducing the specified hydraulic flow.

The corresponding Bosch service instructions must be adhered to.

The handling of Bosch nozzles and nha in the Bosch service organization has been addressed by our OE-customers who are concerned about this subject.

Our OE-customers will in the future work together only with Bosch services who are equipped with an ultrasonic cleaning device. Suitable devices are available on your national market.

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EDC IN-LINE  
PUMPS WITH  
RE POSITIONER

Workshop: EP  
12.1995  
ST 0429 En

## Adjustment instructions

A detailed and complete description of all testing and adjustment procedures for EDC in-line pumps with RE positioner can be found in the respective microcard test instructions. It is absolutely essential to ensure compliance with the measurement accuracies (specifications) stated in these instructions with regard to the DC voltmeter.

### Voltmeter:

The respective test instructions quote the following for the voltmeter (digital multimeter) as regards basic accuracy requirements for the DC measuring range in the list of testers, fixtures and tools:

- \* Deviation from reading less than 0.1 %
- \* Resolution 0.001 V in measuring range up to approx. 4 V

Compliance with these stipulations is absolutely essential.

## **Voltmeter:**

Our investigations into various occurrences have revealed that the measuring instruments used were not sufficiently accurate.

This leads to considerable overshooting of the IP adjustment tolerances and thus to complaints with regard to performance, engine power and consumption.

In a worst-case situation, the engine will not start.

The Bosch range now includes the new digital multimeter MMD 302 - 0 684 500 302 which satisfies the above accuracy requirements. The small Bosch unit MMD 301 - 0 684 500 301 is not sufficiently accurate and therefore unsuitable.

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PE(S)...H... WITH  
EDC POSITIONER RE...  
(CONTROL-LEVER PUMP)

Workshop: EP  
12.1995  
ST 0512 En

Conversion instructions for  
pump-housing replacement

The conversion instructions below  
apply to the following IP assemblies  
for Mercedes-Benz commercial vehicles:

0 402 696 032  
0 402 696 033  
0 402 698 032  
0 402 698 033

In mid-1995 the range of above-mentioned injection pumps and RE positioners was converted to new adjusting magnets (with Hi-eX special bushing) and to "high oil level".  
High oil level: No oil pump in positioner and no radial-lip-type oil seal in camshaft bearing flange.

Dispensing with the oil pump means that there is also no oil-pump connection (hose connection) in the pump housing.

Use of the previous pump housing is now prohibited. Only the new pump housing with no oil-pump connection is available as service replacement part.

## **Repair procedure:**

When replacing the pump housing, old pumps are to be converted to high oil level, i.e. the oil pump and the radial-lip-type oil seal in the camshaft bearing flange are to be removed.

Note: Gasket must always be removed as well to prevent flooding of the positioner. The conversion procedure described here only refers to replacement of the pump housing and is independent of the positioner conversion to Hi-Ex adjusting magnet described in the service telegram "RE-positioner repair; general introduction of adjusting magnet with Hi-eX bushing".

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DISTRIBUTOR-TYPE FUEL--  
INJECTION PUMPS  
VE..F..

Workshop: EP  
02.1996  
SI 0511 En

Replacement of plunger return springs  
with K-OT calibrated distributor head

Affects: Distributor-type fuel-  
injection pumps VE..F..  
for DI engines.

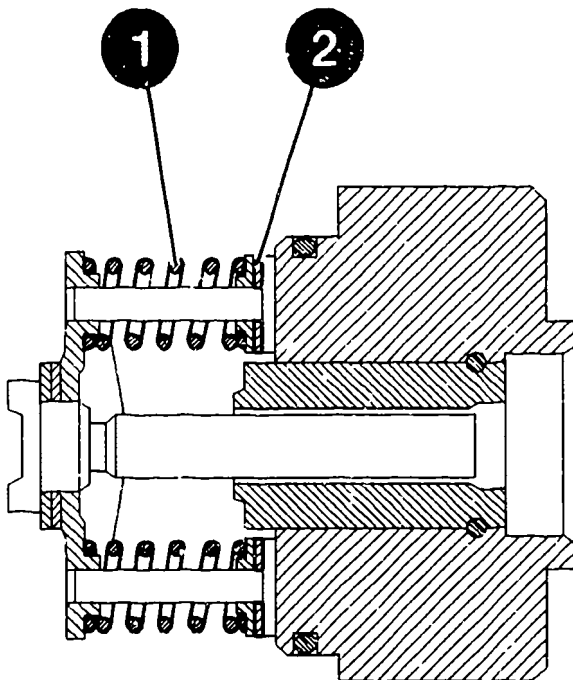
Identification: K-OT entered in place  
of KF setting dimension  
in corresponding test-  
specification sheet.

If a plunger return spring breaks or the shim beneath the spring seat is lost, it will no longer be necessary in future to replace the entire distributor head assembly.

The plunger return spring assembly calibrated to date in line with K-0T (plunger return spring in TDC position of distributor-pump plunger) now features more reasonably priced repair (incorporation of "Plunger return spring parts set" into service-parts list).

- 1 = Plunger return spring
- 2 = Shim

KMK06459



The parts set (plunger return spring) is being added to the service-parts list under item 50/804.

| Parts set     | KF dimension |
|---------------|--------------|
| 1 467 010 376 | 5.8...6.2 mm |
| 1 467 010 352 | 5.2...5.6 mm |
| 1 467 010 410 | 6.2...6.6 mm |
| 1 467 010 411 | 5.0...5.4 mm |

The service-parts lists for the pumps concerned will be gradually altered.

When repairs become necessary, take KF dimension from table indicated in line with parts set and calibrate plunger return springs.

**NOTE:**

Plunger return springs are only to be replaced in pairs.

KD test-specification sheets concerned will not be retrospectively revised.

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P-PUMP ASSEMBLIES  
FOR SCANIA ENGINES

Workshop: EP  
02.1996  
SI 0513 En

Clamping and driving devices  
for pump assemblies

0 402 946 015

0 402 946 016

0 402 946 017

Due to an engine-flange modification  
made by Scania, BOSCH is now offering  
a new clamping flange to ensure that  
the IP assemblies listed below  
can be tested.

Pump assemblies concerned:

0 402 946 015

PES 6 P 120 A320RS 8038

RQV 250...1000 PA 1239

0 412 926 025

0 421 814 157

0 402 946 016

PES 6 P 120 A320RS 8038

RQV 250...1000 PA 1239-1

0 412 926 025

0 421 814 158

0 402 946 017

PES 6 P 120 A320RS 8039

RQV 250...950 PA 1243

0 412 926 026

0 421 814 162

The following components are required  
for pump testing:

|                         |   |     |     |     |
|-------------------------|---|-----|-----|-----|
| * Clamping flange (NEW) | 1 | 685 | 720 | 240 |
| * Supporting frame      | 1 | 688 | 030 | 184 |
| * Coupling              | 1 | 686 | 401 | 024 |
| * Drive flange          | 1 | 685 | 702 | 073 |

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IP ASSEMBLIES  
FOR SCANIA ENGINES

Workshop: EP  
02.1996  
SI 0514 En

Procedure for lead sealing of  
drive-end LDA on IP assemblies

Since the start of 1995, lead sealing  
of the drive-end LDA has been  
performed directly by Scania.

If a replacement unit is ordered via  
BOSCH - KH/ALP for service purposes,  
this is likewise supplied without  
lead seal.

In this case, the LDA must be lead-  
sealed before delivery/installation  
of the pump in the engine.

The parts required for lead sealing

|                 |               |     |
|-----------------|---------------|-----|
| * capstan screw | 2 910 392 191 | and |
| * straight pin  | 2 423 102 005 |     |

(see also service parts list) must  
be ordered separately.

To save time we recommend ordering the necessary components for lead-sealing at the same time as ordering the replacement unit.

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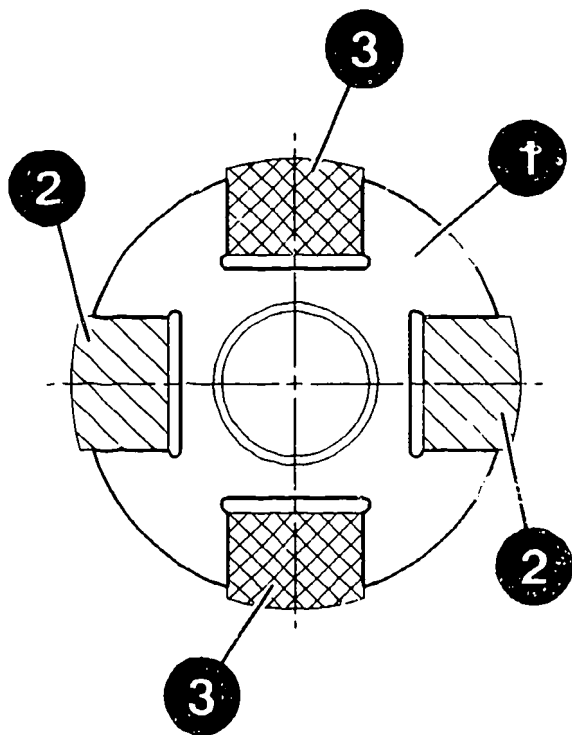
DISTRIBUTOR-TYPE  
FUEL-INJECTION PUMP  
VE..F.. (DI)

Workshop: EP  
02.1996  
SI 0517 En

Introduction of phosphated yoke

On VE-pumps with phosphated yoke (1),  
distinguishing feature: GREY,  
assignment take place in the run-in  
phase between the cam plate jaws (2)  
and drive shaft jaws (3) and the  
grooves of the yoke.

KMK06633



Interchanging of the jaws in the grooves of the yoke results in considerable wear and can cause pump failure.

When performing repairs, assignment of drive shaft jaws to yoke and cam plate must be maintained.

Always ensure compliance with the procedure described in the following when disassembling/assembling yoke.

#### **PUMP REPAIR PROCEDURE**

Before removing cam plate and drive shaft, mark position of respective jaws in yoke.

On reassembly, assemble the previously marked parts.

When replacing cam plate or drive shaft, fit N E W yoke as per service-parts list.

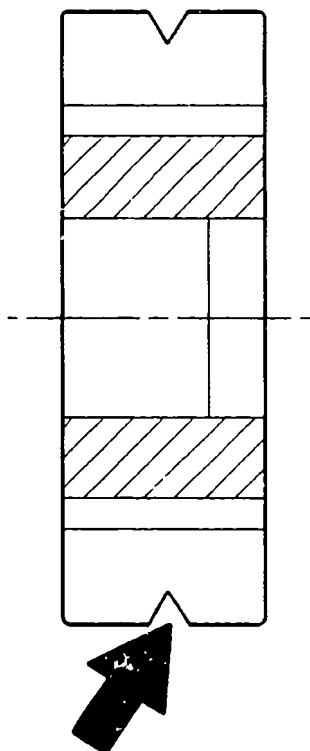
Before installation, dip new yoke  
(phosphated) in lubricating oil for  
approx. 1 min.

Lubricating oil to be used:  
Part no. 5 701 050 610  
1 liter size

Allow yoke to drip off for at least  
2 min. and fit in pump within a day.

Note:  
This measure does not affect yokes  
with identifying groove on OD  
(arrow).

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# TESTING IN-LINE PUMPS

Workshop: EP

02.1996

ST 0518 En

## Additions to test-specification sheet

The test-specification sheet has been extended to include a definition of the

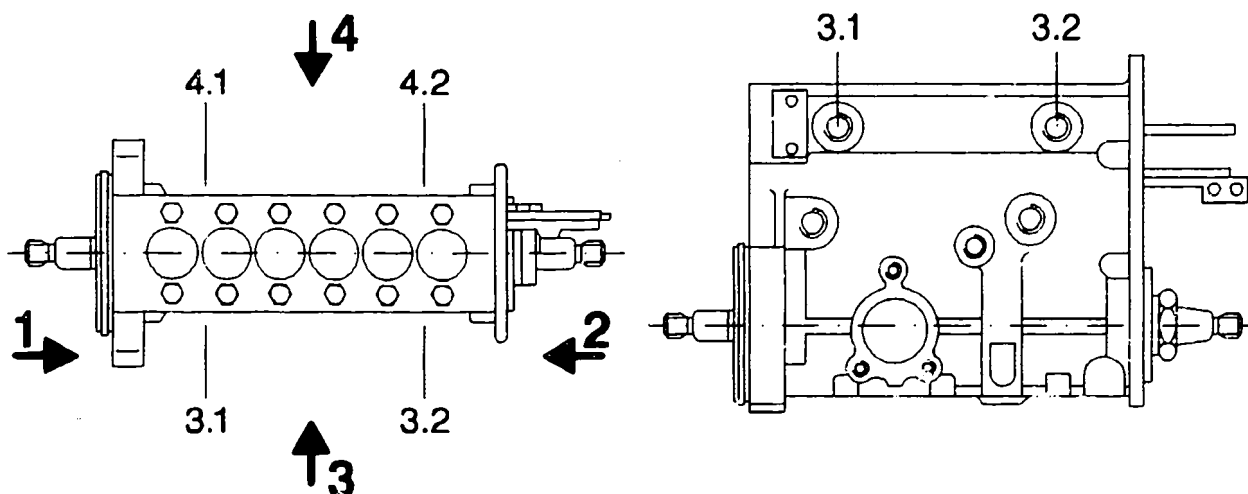
- \* mounting position of the inlet line and the
- \* vibration damper (RoBo diaphragm).

## DEFINITION OF MOUNTING POSITION

- 1...4 = Pump sides  
3.1 and 3.2 = Mounting position,  
pump side 3  
4.1 and 4.2 = Mounting position,  
pump side 4

If no data is given in the test-specification sheet, proceed in accordance with information provided in valid test instructions, in line with general instructions in microcard W-400/002 ("Test equipment, test conditions") or as per Service Info.

KMK06635





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ELECTRICAL  
CONNECTIONS

Motor vehicle:  
PKW,NKW,FZD,PKB  
Workshop: EL, EP

ASSESSMENT OF FUNCTION

06.1996  
SI 0516 En

Electrical connections between components and wiring harness are exposed to numerous impacts:

Fluctuations in temperature, humidity or atmospheric pressure, contact with water, fuel or oil and deposits (dust, dirt and/or salt).

Mechanical stresses such as tension, compression, vibration and acceleration also occur.

This leads to faults with electrical connections, particularly on older vehicles.

## **1. ASSESSMENT OF OVERALL CONNECTION**

**Connector attached.**

- Cable too short or damaged
- Connection severely fouled
- Seat loose (with/without lock)
- No spring clip on plug
- Plug housing damaged
- Protective cap leaking

**Disconnected component plug**

- Sealing edge damaged
- Plug pins damaged  
(see Figs. in Section 3)
- Parts of plug corroded
- Foreign matter on plug

**Disconnected wiring-harness plug**

- End sealing ring deformed or missing
- Non-engaged contacts damaged/pushed back or no contact

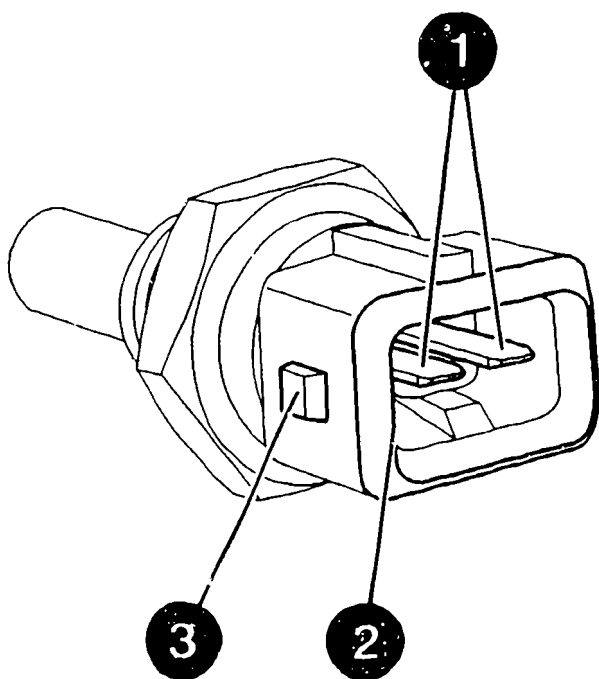
## 2. ASSESSMENT OF PLUGS

The two Figs. show the frequently used two-pin blade terminals of many Bosch components.  
Other multi-pin plugs are usually of similar design.

Assessment of component plug  
Note the following (see Fig.):

- Plug pins (1)
- End sealing edge (2)
- Side locking lugs (3)  
for spring clip

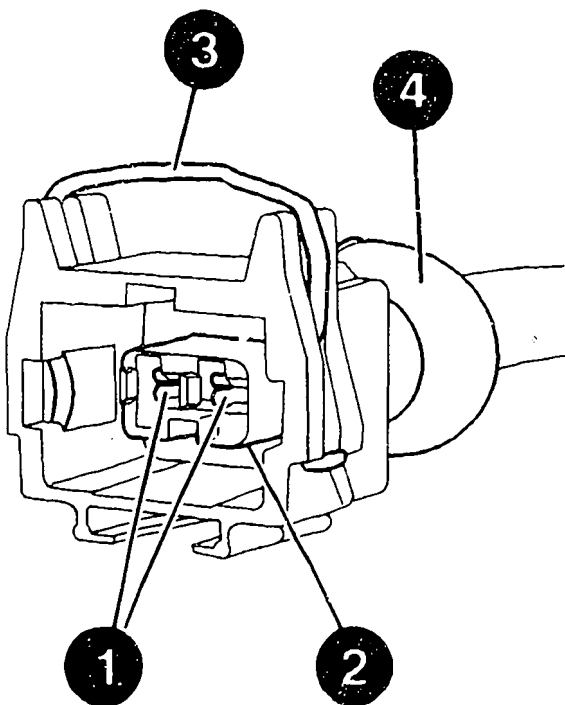
KKE01062



**Assessment of wiring-harness plug**  
**Note the following (see Fig.):**

- Flat spring contacts (1)
- End sealing ring (2)
- Spring clip (3)
- Protective cap (4)

KKE01063



### 3. ASSESSMENT OF PLUG-IN CONTACTS

The following Figs. illustrate examples for the assessment of serviceable and damaged plug pins.

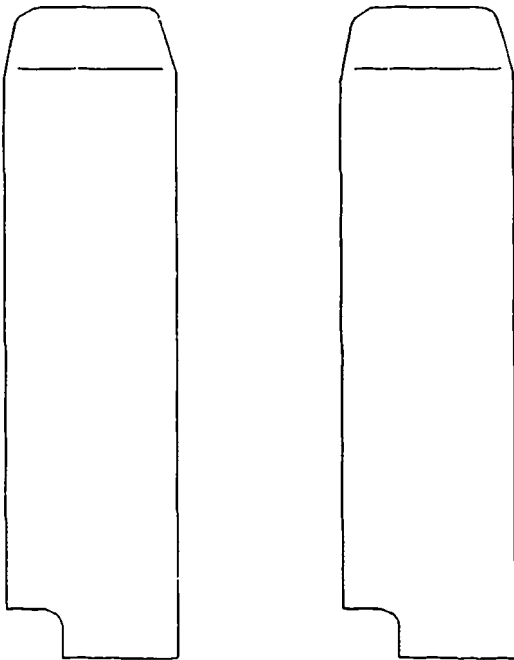
**NO CONTACT MARKS (new)**  
(see Fig.).

**Findings:**

- No contact marks
- No appreciable dimensional or geometric errors on housing or plug section
- Plug pins not at an angle

**Assessment:**  
Plug pins OK.

KKE01064



**NORMAL CONTACT MARKS**  
(see Fig.)

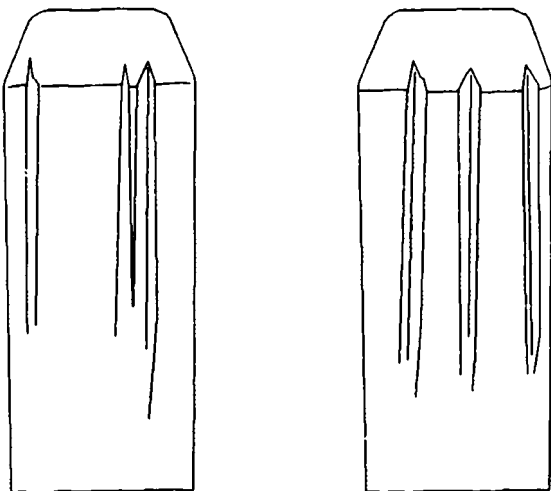
**Findings:**

- Contact marks in center of plug pin
- Contact overlap (groove length on contact surface) more than 1 mm

**Assessment:**

Plug pins OK.

KKE01065



## MECHANICAL CONTACT MARKS (see Fig.)

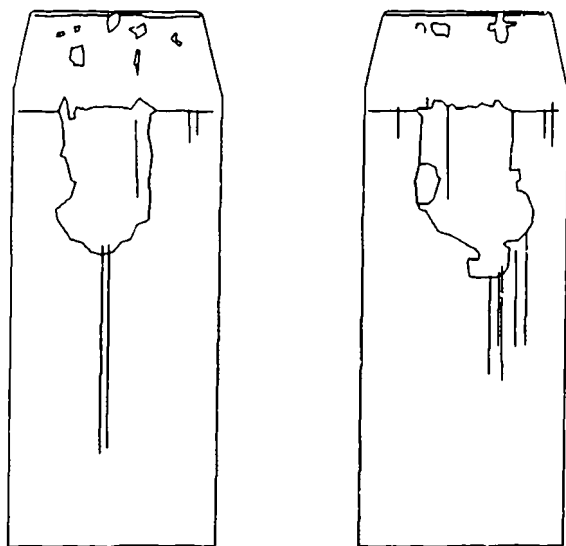
### Findings:

- Contact point damaged  
(scratched or scored)
- Pins bent (bent plugs due to  
inexpert handling of measurement  
prods)
- Partial flaking of tinned surface  
(indication of wear)

### Assessment:

Plug pins not OK.

KKE01066





# OXIDIZED CONTACT MARKS (see Fig.)

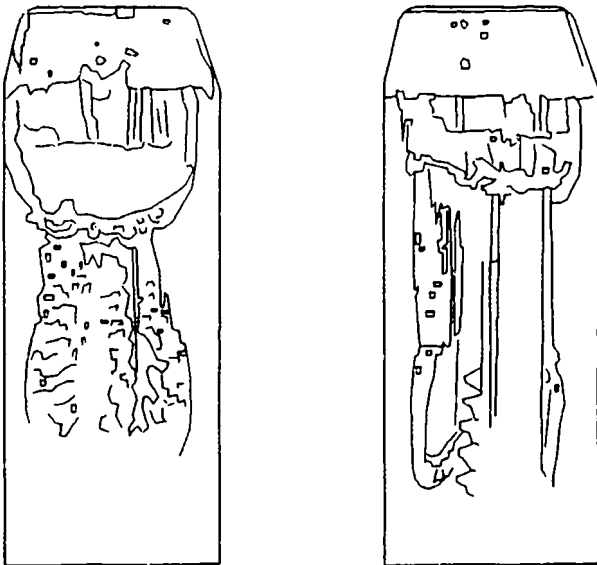
## Findings:

- Severe oxidization of contact point, oxidation residue (e.g. tin oxide)
- Friction corrosion
- Surface finish worn down to substrate

## Assessment:

Plug pins not OK.

KKE01067



**THERMAL CONTACT MARKS**  
(see Fig.)

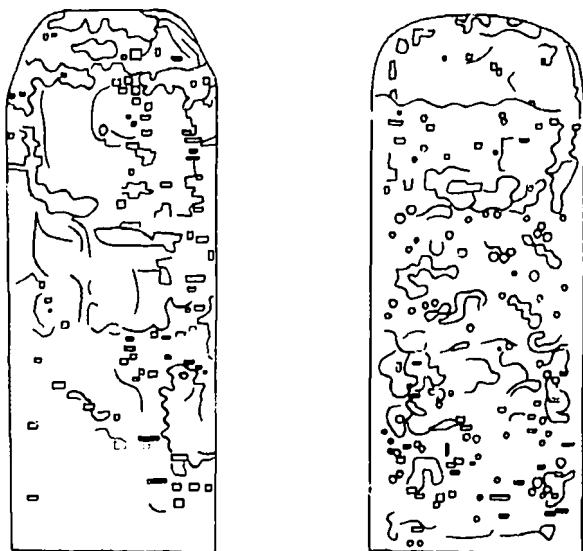
**Findings:**

- Contact scorched
- Contact surface discolored due to overheating

**Assessment:**

Plug pins not OK.

KKE01068



**DEPOSITS**  
(see Fig.)

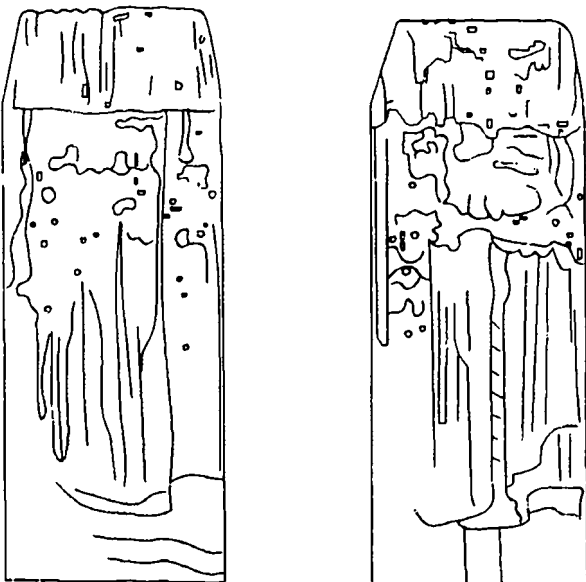
**Findings:**

- Deposits and condensates on plug pins
- Residue on plug pins
- Plug pins covered with lacquer for example
- Contact point partially corroded
- Loose particles (dust, dirt etc.) on plug or contact

**Assessment:**

Plug pins not OK, leaky connection.

KKE01069



#### 4. IMPORTANT

- \* Any attempt to eliminate contact problems with a brush or treatment with contact spray does not generally meet with lasting success. It is better to renew the contacts straight away.
- \* Component and wiring-harness plug must have the same surface finish: Either both tinned or both gold-plated.

- \* If the component plug is to be renewed, then the wiring-harness plug must be as well; it is normally damaged anyway and problems could soon be encountered again if use were to be made of a new connector with an old socket.
- \* A bright lamp and a magnifying glass are needed for exact assessment of a plug pin.

**Note:**

The black/white plug illustrations shown here are not of outstanding quality. A better impression is given by the color chart "Bosch-Tips" 4 400 001 018.

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FORD NEW HOLLAND  
(FNH) TRACTORS  
WITH RSV GOVERNORS

Motor vehicle: NKW  
Workshop: EP  
06.1996  
ST 0509 En

### Unstable idling

If unstable idling is encountered with Ford New Holland tractors (FNH), the problem can be eliminated by converting the RSV governors.

This affects the following injection pump/governor assemblies up to date of manufacture (FD) 564:

\* 0 400 876 405 and ..406

\* 0 402 076 750 and ..751

### REMEDIAL MEASURES

Assembly:

0 400 876 405

Governor:

Designation: RSV 400...1050 A2C2263-1L

Part no.: 0 420 232 584

In future:

Designation: RSV 400...1050 A0C2263-8L

Part no.: 0 420 232 615

Components:

\* Flyweight assembly

1 428 194 028

\* Spring retainer

1 420 506 680

\* Extension spring

2 424 650 008

## REMEDIAL MEASURES

Assembly:

0 400 876 406

Governor:

Designation: RSV 400...1050 A2C2263-2L

Part no.: 0 420 232 585

In future:

Designation: RSV 400...1050 A0C2263-9L

Part no.: 0 420 232 616

Components:

|                      |   |     |     |     |
|----------------------|---|-----|-----|-----|
| * Flyweight assembly | 1 | 428 | 194 | 028 |
| * Spring retainer    | 1 | 420 | 506 | 563 |
| * Extension spring   | 2 | 424 | 650 | 008 |

## REMEDIAL MEASURES

Assembly:

0 402 076 750

Governor:

Designation: RSV 400...1050 P2A557

Part no.: 0 421 833 394

In future:

Designation: RSV 400...1050 P0A602

Part no.: 0 421 833 483

Components:

|                      |   |     |     |     |
|----------------------|---|-----|-----|-----|
| * Flyweight assembly | 9 | 428 | 270 | 023 |
| * Spring retainer    | 1 | 420 | 506 | 567 |
| * Fork lever         | 9 | 420 | 270 | 011 |
| * Extension spring   | 2 | 424 | 650 | 008 |

## REMEDIAL MEASURES

Assembly:

0 402 076 751

Governor:

Designation: RSV 400...1050 P2A557-1

Part no.: 0 421 833 396

In future:

Designation: RSV 400...1050 P0A603

Part no.: 0 421 833 484

Components:

|                      |               |
|----------------------|---------------|
| * Flyweight assembly | 9 428 270 023 |
| * Spring retainer    | 1 420 506 689 |
| * Fork lever         | 9 420 270 011 |
| * Extension spring   | 2 424 650 008 |

After conversion, the governor is to be re-marked accordingly.

The converted injection pump/governor assembly is to be adjusted in line with the valid test specification sheet.

The costs of replacement parts are to be indicated on the warranty claim with fault number 40 and the text:

"Flyweight alteration".

The costs of conversion are to be billed to the customer (max. 2 h).

Measure is limited to 30-04-1997.



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